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GARBAGE DISPOSAL, PUBLIC SANITATION, BRIDGES.

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SMITHSONIAN DEPOSIT

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NO ONE SET, however, was found to embrace all the good points of others and many of the better ones were cumbersome in the extreme. These forms were afterward taken in hand by competent accountants and carefully studied, and, after a thorough sifting and pruning, the best features of all were embodied in The American Water-Works Standard Bookkeeping System.

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Municipal Engineering

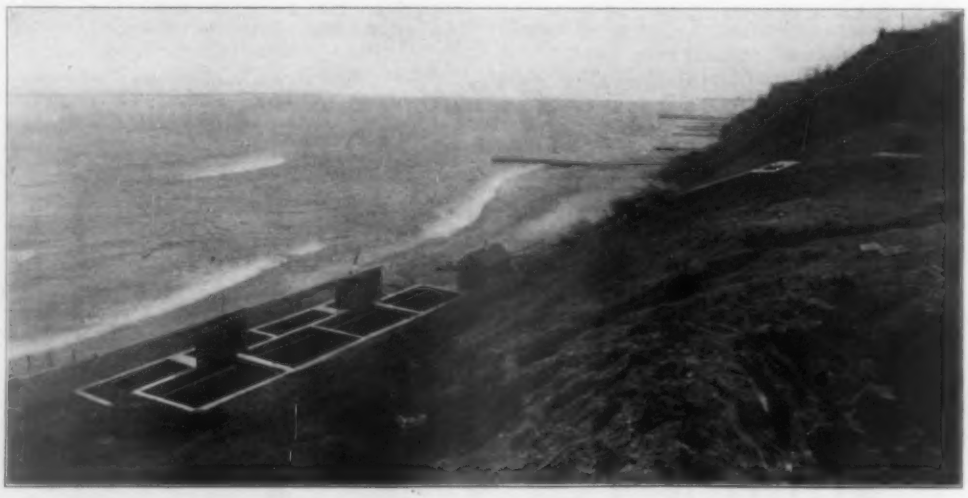
VOLUME XXII. JANUARY, NINETEEN HUNDRED TWO. NUMBER 1.

SEPTIC TANK AND SEWAGE FILTERS AT GLENCOE, ILL.

A new installation of septic tank and filter beds for treating the sewage of about 600 population has recently been made at Glencoe, Ill., using the system which has been in successful operation at Exeter, Eng., for about five years, and which is represented in this country by the Cameron Septic Tank Company of Chicago. The total flow of sewage and storm water provided for is 25,000 gallons a day. While this is a small amount, the success of the plant will indicate the possibilities for larger quantities.

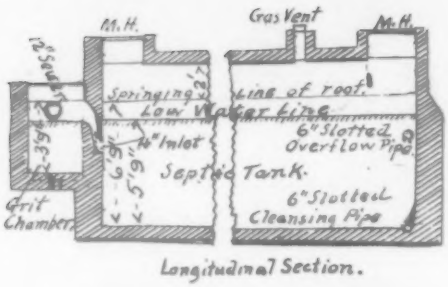
The principle upon which the system is designed is that of giving each of the great classes of bacteria which break down the organic compounds in the sewage its opportunity to operate for the proper time. The anærobic bacteria reduce the matters in suspension to soluble compounds during the passage of the sewage through the septic tank, in which the supply of oxygen is kept as low as possible. The ærobic bacteria, requiring plenty of fresh air for their best condition, are given their turn in the open filter beds, which are operated intermittently, thus insuring frequent and complete change of air, and full supply of oxygen.

From the drawings and the photograph, which accompany, an idea of the design and method of operation of the tank can be obtained. An important part of the apparatus under the control of the company constructing the works is the automatic machinery for changing the point of discharge of the effluent from the septic tank, so that the continuous flow from the tank can become an intermittent flow through the filters without constant personal attendance. This is not well shown in the detail drawings and must be seen to be fully appreciated.

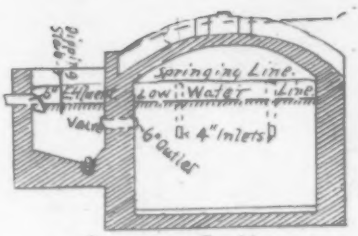


FILTER BEDS, GLENCOE, ILL.

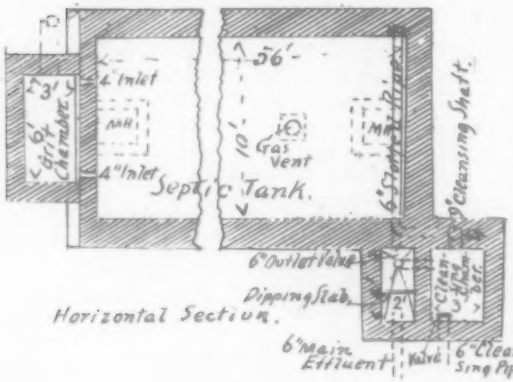
The main outfall sewer, 12 inches in diameter, discharges into the grit chamber shown in the drawings of the septic tank, where the heavier matters, inorganic in their composition, may be in part deposited.



Longitudinal Section.



Transverse Section.



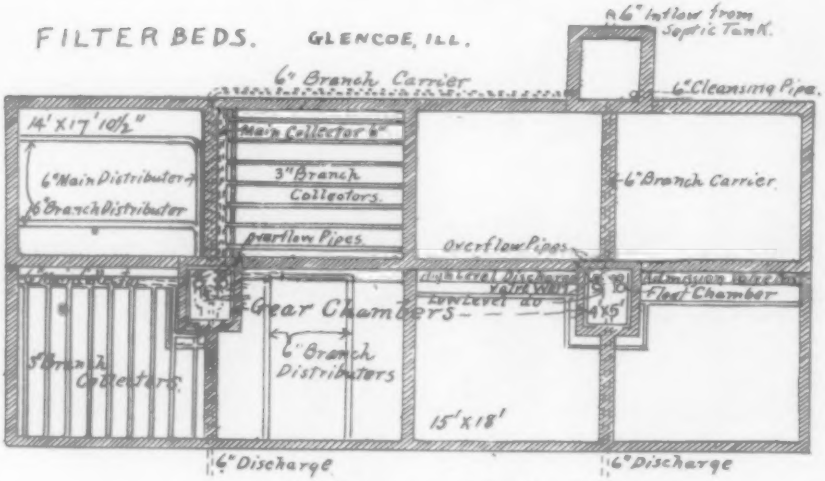
Horizontal Section.

SEPTIC TANK.

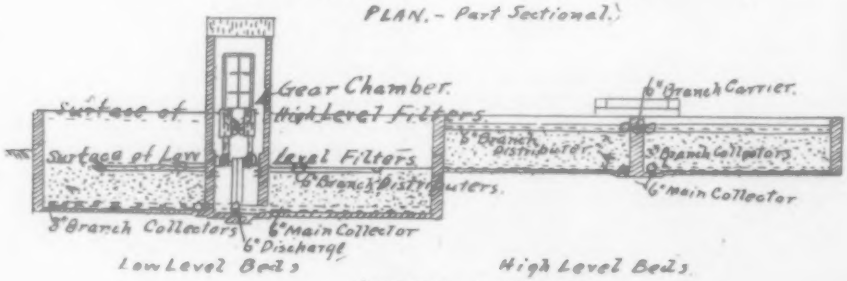
GLENCOE, ILL.

Scale.
0' 2' 4' 6' 8' 10'

FILTER BEDS. GLENCOE, ILL.



PLAN. - Part Sectional.



VERTICAL SECTION.

Thence the sewage flows through two 4-inch inlets into the septic tank, being discharged about two feet below the low water line in the tank in such manner as to produce slight agitation. The grit chamber is 6 by 3 feet and 4¾ feet deep. The septic tank is 10 feet by 56 feet and is 5¾ feet deep below the low water line or 6¾ below the springing line of the arched roof which covers it. The liquid is drawn off through a 6-inch pipe suspended across the end of the tank opposite the entrance, about 2¼ feet below the springing line. This pipe is slotted on the under side so that water can enter it all along its length and flow without current disturbance of the tank into the effluent chamber, 2 by 4 feet, which has a "dipping slab" to break up surface currents and a 6-inch effluent pipe. Directly under the slotted pipe in the septic tank, and in the lowest line of the bottom of the tank, is a similar slotted pipe with the slot in the upper surface, through which it is expected to draw the small amount of sludge which accumulates into a cleansing shaft and chamber. The bottom of the effluent chamber is pyramidal in shape and is connected at its lowest point with the cleansing chamber.

The effluent pipe discharges the partially purified sewage into a receiving chamber 6 by 6 feet, also provided with a cleansing pipe at its bottom. From this chamber the sewage is carried by 6-inch pipes to one of two gear chambers from which it is distributed alternately over the filter beds through 6-inch main distributing pipes discharging into branch distributing stoneware channels laid on top of the filtering material. There are eight filter beds, four high level, on which the sewage is first distributed, and four low level, so located that the filtrate from the upper beds is distributed over the surface of the lower beds, the effluent from the second filtration being sufficiently pure to be discharged into the lake below. The general plan of the filters and gate chambers can be seen from the drawings and from the photograph, which also shows their location on the hill side and with reference to Lake Michigan.

The automatic alternating gear permits the sewage to flow on one of the upper filters until it is full, when a small quantity overflows into a bucket which closes the admission valve and turns the sewage on the other high-level filter in the set. The sewage remains in the filter from four to six hours, when the discharge valve opens automatically and the effluent escapes through the collectors and drains in the bottom and flows on the lower filter. The valves of the lower filter are operated with those of the upper filter so that the two filters operate together according to the fixed program.

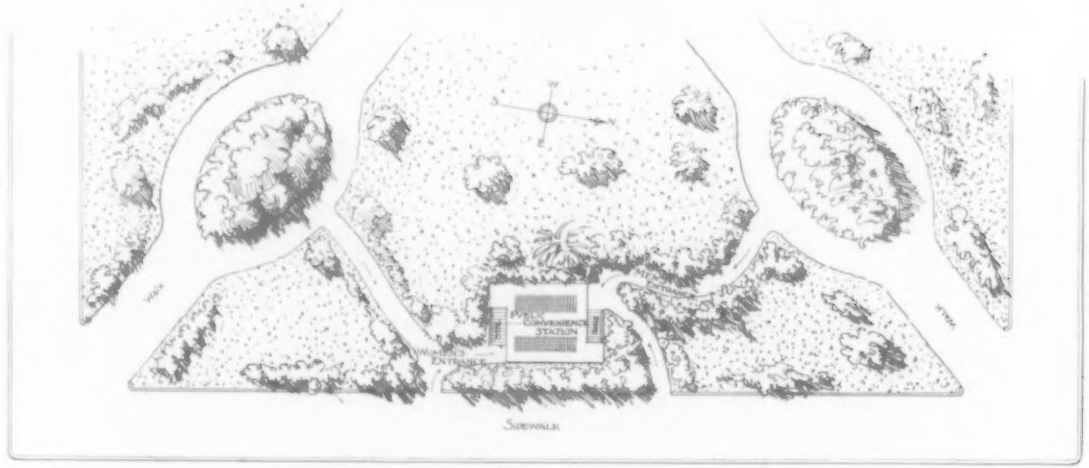
The filtering material used is furnace clinker.

A DESIGN FOR A PUBLIC CONVENIENCE STATION.

A city engineer asked, in the question department of our October number, for information concerning public convenience stations. The city of San Francisco has been considering the same question, and in the November number of the *Merchants' Association Review* appeared a design for such a station. By the courtesy of the superintendent of the association, Mr. L. M. King, we are enabled to reproduce the design herewith.

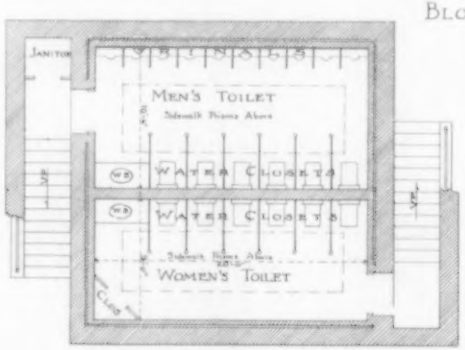
It will be seen that the structure is to be placed entirely underground, in a public square, close to an important street, that it may be in the most convenient location possible. This station is experimental, and if constructed and operated successfully will doubtless lead to the establishment of others. American cities have neglected this important matter, partly because the methods used in foreign cities do not conform with American ideas and because dependence is placed on hotels, saloons and public buildings. The changes in conditions require that such conveniences be provided, and the inquiries for satisfactory designs are increasing in number.

In preparing this design the Committee on Permanent Improvements of the Merchants' Association, which had the matter in charge, considered the question of underground or overhead structures, and decided that popular favor in San Francisco would be obtained more readily for the underground station. It was first proposed to locate the structure under the pavement, convenience of access by foot passengers being an essential, but the presence of pipes, sewers, conduits and foundations made such a location difficult to make. Doubtless some future stations will be so located. The plans and sections show clearly the design and the dimensions. It will be observed that the general lines are those of the station in

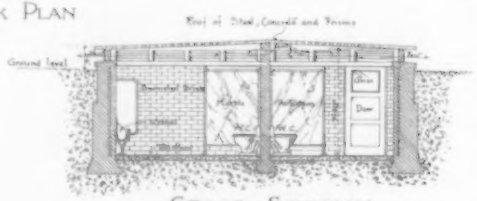


STOCKTON STREET

BLOCK PLAN



PLAN



CROSS SECTION

SKETCH PLANS FOR

PUBLIC CONVENIENCE STATION

IN

VNION SQVARE

FOR THE

MERCHANT'S ASSOCIATION

OF SAN FRANCISCO

EDWARD R SWAIN, ARCHITECT

City Hall Square, New York. Tile floor on cement, white glazed brick lining for walls, skylight ceiling with round glass prisms form the building. The arrangement of shrubbery to preserve the appearance of the park is shown in the block plan.

The complete double station, fitted with modern closets and automatic flushing apparatus, with marble partitions of closets and separate porcelain urinals, set in nickel-plated frames, paneled oak doors, similar to the fittings of a first-class office building, is estimated to cost $3,417.48 for the building and $3,427.50 for the plumbing; a total of $6,844.98. If neat cast-iron frames, cast-iron urinal trough and cast-iron partitions, thoroughly painted with white enamel paint, are substituted, the cost of plumbing can be reduced to $2,375.50, and the total cost to $5,792.98.

Maintenance charges will include electric lights, water supply, soap, towels and toilet paper, one woman attendant during open hours and part of the time of one of the park workmen.

MAIN STREET AT CHANDLER, WORCESTER, MASS.
BLOCK PAVING WITH AND WITHOUT CEMENT FILLING.

PAVEMENTS FOR WORCESTER, MASS.

The city of Worcester, Mass., has long been noted for its progressive spirit in many directions. One of the evidences that the business men of the city are alive to the opportunities for municipal improvement and are educating public opinion to the point necessary for the highest development of pride in the beauty and convenience of the city is found in *The Worcester Magazine*, which is "devoted to good citizenship and municipal development." The magazine is now a year old, and is a credit in appearance and in contents to the Board of Trade, by which it is published, the committee on publication and the editor. Live questions of improvement in business and municipal conditions are discussed in each number, and the magazine should have a marked effect upon the advancement of the city.

The older municipalities are likely to be conservative in taking up projects for their material improvement, and Worcester has been no exception to the rule. The sewer and sewage disposal questions were forced upon the attention of the city officials some ten or fifteen years ago and now the city is very well supplied with sewers, the system of outlet and intercepting sewers being particularly elaborate, and the sewage disposal plant a development from expensive experi-

PEARL STREET BRICK PAVEMENT, WORCESTER, MASS.

FOSTER STREET ASPHALT PAVEMENT, WORCESTER, MASS.

ments on a large scale. The subject of conduits has received considerable attention of late and overhead wires have been very generally removed from the streets.

Largely on account of the tearing up of the streets to construct the sewers and conduits, no doubt, the matter of street paving has not heretofore received the attention it should from so progressive a city. The illustration of the condition of Main street at the corner of Chandler, which accompanies, will show the present condition of some of the streets. On the left of the view will be seen old-fashioned, irregular stone block paving; on the right, a cement filled block pavement which is apparently a material improvement.

But little brick paving is used in New England cities on account of its high cost in proportion to its value when compared with other materials. If the recent attempt to make paving brick from Massachusetts clay is successful this reason will soon be removed. Worcester has a little of this kind of pavement, a section of which is shown in the illustration of Pearl street. There is also some asphalt paving in the city of the character shown in the illustration of Foster street.

We are indebted to *The Worcester Magazine* for these illustrations which accompanied an article upon street pavements, discussing the various kinds of material used and their adaptability to Worcester conditions. The very modest appropriation of $100,000 a year for three years is asked that the problem may be attacked systematically. The experience of all other cities of the size of Worcester is that the advantages of good paving are so clearly demonstrated by a small amount of systematic paving that further appropriations are easily obtained, and the city's improvement advances steadily.

SOME NOTES ON ELECTRIC LIGHT AND POWER DISTRIBUTION. THE LAWRENCEVILLE LIGHT AND WATER PLANT.

By Daniel W. Mead, Consulting Engineer, Chicago.

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The general movement toward the formation of combinations represents the outworking of an economical principle which every engineer should carefully consider.

The organization of separate companies for the furnishing of gas, water, heat, electric light and power or other public utilities for small communities results in an extravagant expenditure in the management of such companies, which can be reduced by the formation of a single company having the management of all or a number of such works. Such combinations result not only in a saving in the cost of management and of office expenses, but also, when the works are grouped under one roof, in a saving in first cost, and in labor, tools, heat, light and other power station expenses. The necessity for such saving increases as the size of the plant diminishes, and in the smaller municipalities the only way in which such utilities can be installed with profit is under a common management.

The above principle is illustrated in a small way in the plant of the Lawrenceville Light and Water Company, of Lawrenceville, Ill. This company was organized to construct works for furnishing public and private electric lights, domestic water supply and public fire protection.

Lawrenceville, Ill., is a village of about 1,500 inhabitants, and lies on the Embarrass river, about nine miles west of Vincennes, Ind. The power station of this company, a comparatively inexpensive brick structure, is illustrated in Figure 1.

The electric lighting system is a 220-volt direct current system. The generators are one of 30 and one of 20 kilo-watt C. C. They are coupled directly to Chandler & Taylor high speed engines, as shown in Figures 2 and 6. The arc lamps are operated four in series, each arc requiring about 45 volts, and a special resistance coil, reducing the voltage in the line to that necessary to supply the arcs. Where less than four arcs are required 110-volt enclosed arcs are used, two in series. The wiring is arranged on a three-wire basis, there being a separate positive wire for the arc and the incandescent service, and a common negative wire for both services. By this means, whenever the positive arc wire is disconnected on the switchboard, the arc lights are cut out of circuit. The two generators are arranged to run singly or in multiples, as the current

needed requires. The diagram (Figure 5) illustrates the switchboard connections, and the board itself is shown in Figure 4.

The water supplied is obtained from bored wells, about 300 feet in depth, which end in a somewhat porous limestone stratum, from which the water is derived. Two of these wells are located near the pumping plant, one being within the station, and the second about 100 feet away. Both of these wells are operated by steam driven deep well pumps. These pumps consist of single acting power heads, to which are directly attached, by gearing, small vertical engines. (See Fig. 8.) A third well has been drilled some 2,000 feet away, and is pumped by a similar pump, to which is attached a direct current 220-volt motor. (See Fig. 7.) All of these pumps are arranged to pump directly into the mains and pressure tanks, those near the pump station being also so connected as to deliver the water into a brick storage reservoir as well.

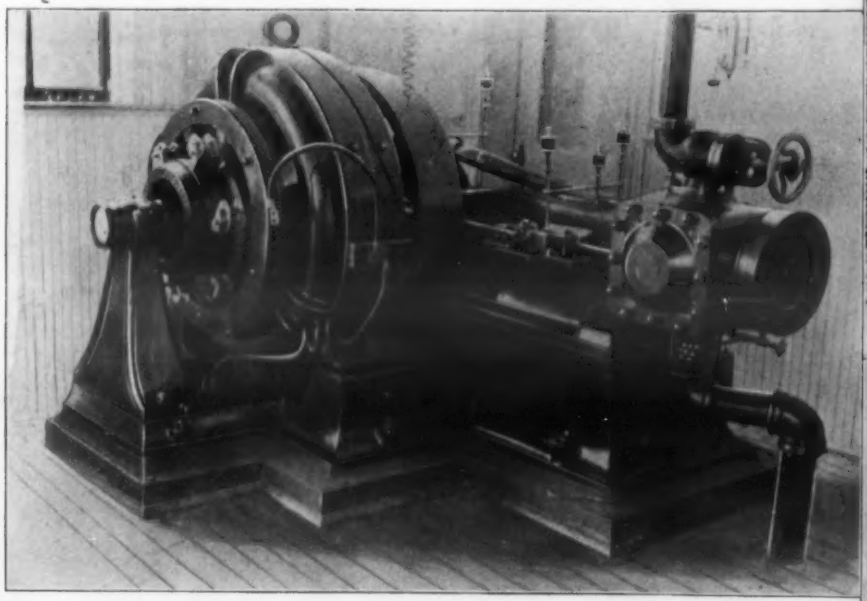
FIG. 1. POWER HOUSE—LAWRENCEVILLE LIGHT AND WATER CO.

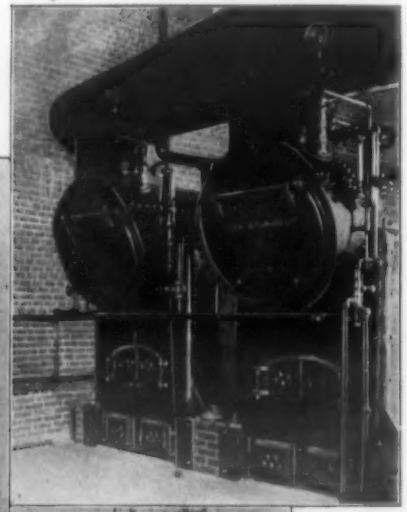
For fire purposes, a duplex direct-acting steam pump of one-half million gallons capacity is provided, which takes the water from the storage reservoir and forces it directly into the mains.

The boiler plant consists of two 50 H. P. internally fired return tubular boilers. These boilers are covered with magnesia covering to prevent radiation.

The system of mains, some two miles in extent, consists of 4, 6 and 8-inch pipe, to which are connected some 35 fire hydrants.

Instead of using a stand tower for storage purposes, there were installed at Lawrenceville two pneumatic pressure tanks. These consist of two steel tanks 8 feet in diameter and 38 feet in length. The mains are connected with the tanks at their lowest point, so that all the water will pass out into the mains before any air escapes. The amount of air needed to supply the amount absorbed by the water is very small, amounting to not more than 20 cubic feet of free air per day, which is supplied by a small air pump having a six-inch cylinder and six-inch stroke, which is run about an hour once a month. The air pressure is kept at about 25 pounds when the tanks are almost free from water. When the tanks are pumped half full of water the air will be compressed to about 65 pounds, and when the pumps are stopped, the water so stored will be forced into the mains as required by the compressed air, the pressure falling in the meantime from 65 pounds with the tanks half full, to 25





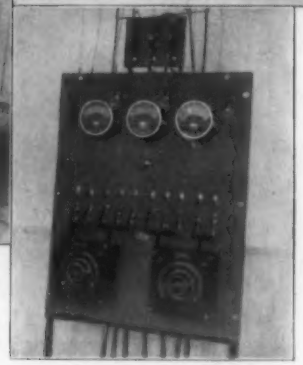


FIG. 2. DIRECT CONNECTED ENGINE AND DYNAMO—LAWRENCEVILLE LIGHT AND WATER CO.

FIG. 3. BOILER PLANT.

FIG. 4. SWITCH BOARD.

pounds when the tanks are just emptying. This system works very satisfactorily for small places, and is less expensive for small capacities or high pressures than an equivalent stand tower. A general idea of the pneumatic tanks used is given by Figure 9.

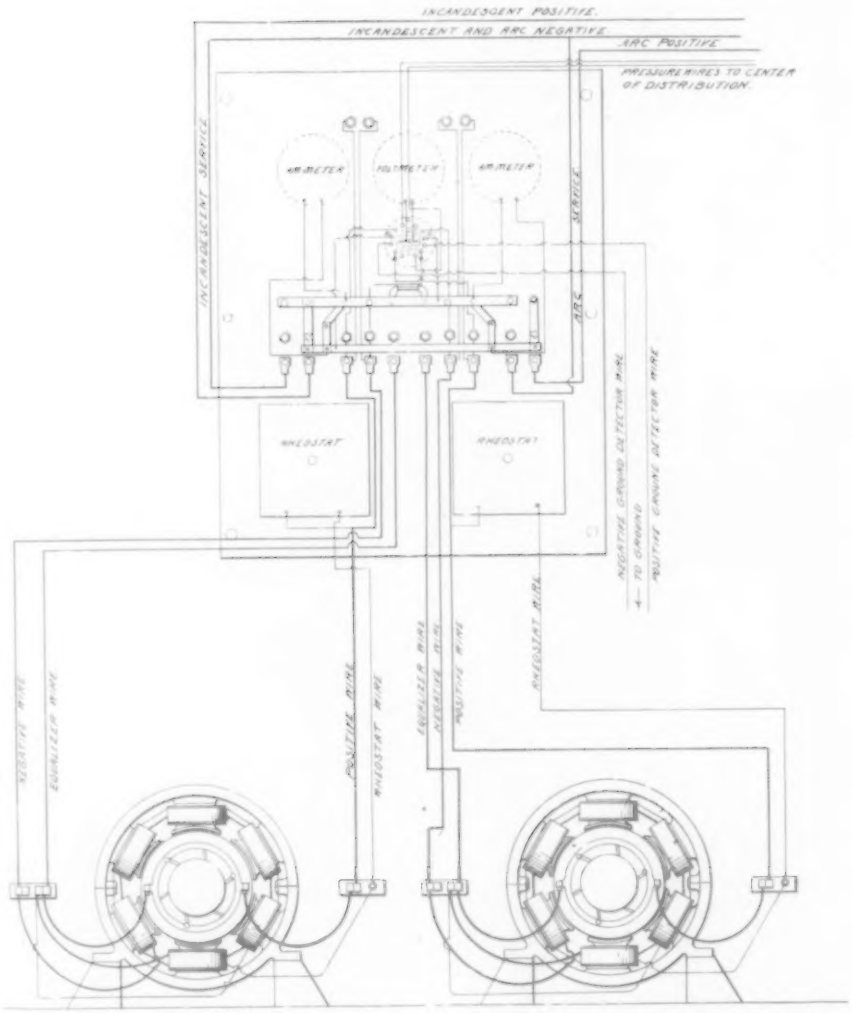
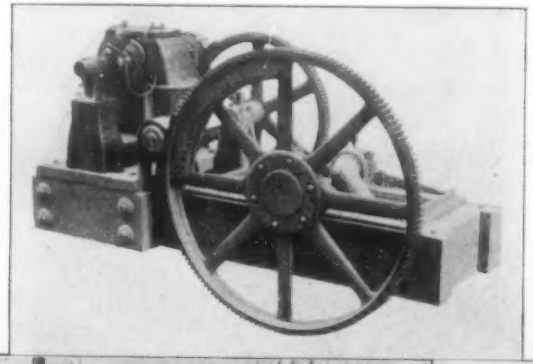
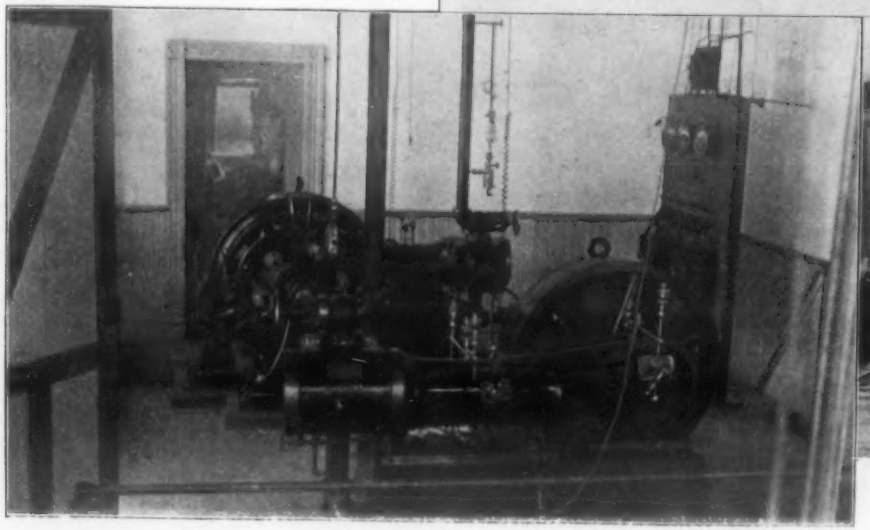


FIG. 5. SWITCH BOARD CONNECTIONS FOR TWO COMPOUND WOUND DYNAMOS IN MULTIPLE.

Under proper conditions the union of light plants, water-works plants, refrigeration plants, gas plants, heating plants, or other installations for public utilities, can be made with advantage, and many plants which are now running without profit, or at a loss, could be placed on a paying basis by the addition of other service which will increase the income of the plant without a proportionate increase in the cost of operation.





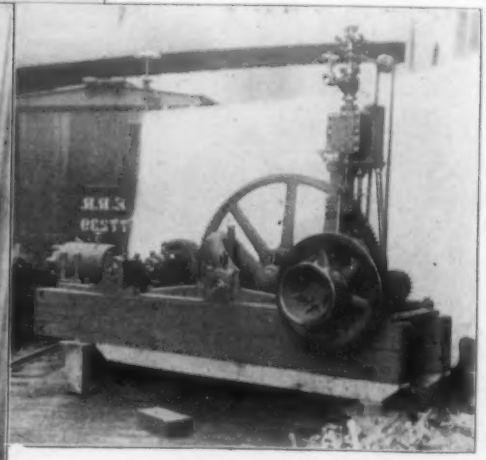


FIG. 6. ENGINE AND DYNAMO ROOM. FIG. 7. ELECTRIC DRIVEN DEEP WELL PUMP. FIG. 8. STEAM DRIVEN DEEP WELL PUMP.
LAWRENCEVILLE LIGHT AND WATER CO.

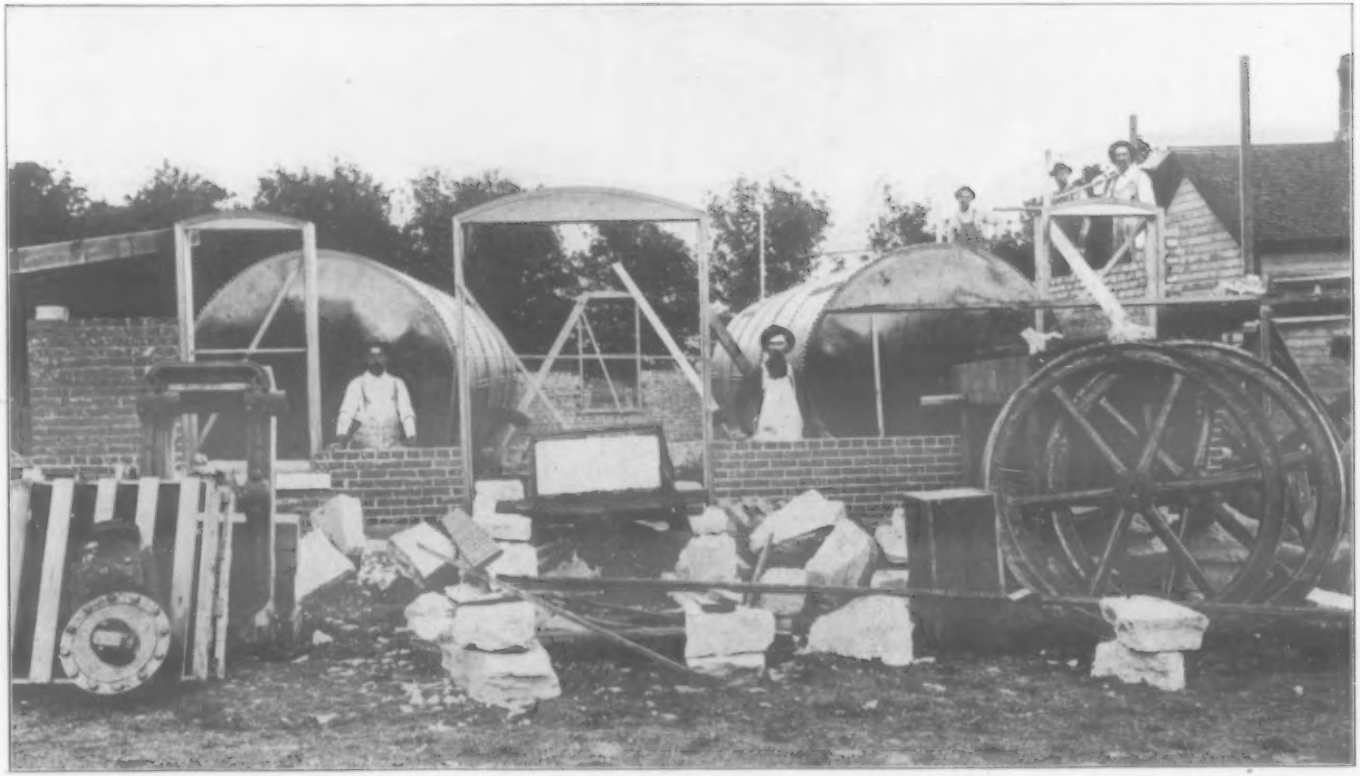


FIG. 9. PNEUMATIC STORAGE TANKS, LAWRENCEVILLE, ILL.

CONCRETE BUILDING BLOCKS.

A recent article in MUNICIPAL ENGINEERING described processes of making the walls of buildings of concrete deposited in forms constructed of wood, thus making the walls a monolith, and of making solid concrete blocks to be put in place in a foundation or wall in the same manner that natural stones are set. In the same article was a description of a method of making monolithic walls with cavities in them and steel strengthening rods, thus saving the material which would be needed to fill the cavities and reducing the cost, while retaining more than sufficient strength.

Ever since Portland cement has been in use there have been experiments in making cement or concrete blocks, many of which have been successful from the technical point of view, but until the recent great reduction in the price of Portland cement of the highest quality, they have not met with commercial success.

It seems to be a simple matter to make a concrete block by mixing the proper proportions of cement and sand or gravel, with, sometimes, the addition of small quantities of other ingredients to reduce the amount of cement, to hasten the setting of the blocks, to make them easy to remove from the molds, etc., but when a price must be made which will enable the manufacturer to compete with the building materials now in use, the balance between proper mixture of materials and quality of workmanship on the one hand and price at which the product can be sold must be carefully struck. The labor of making blocks is an important part of the cost and the machine which will reduce the amount of labor in filling and emptying molds to a minimum, is the one which makes competition in price most effective. Another important item for consideration is the time which the blocks must remain in the molds. It is evident

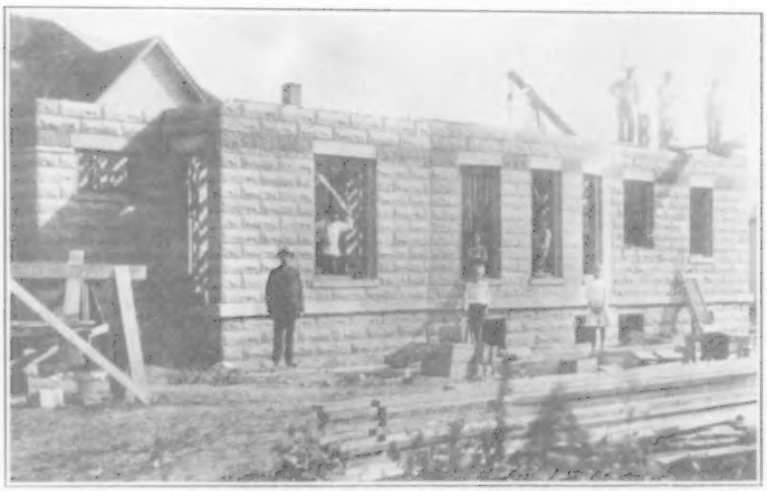
BUSINESS BUILDING OF HOLLOW CONCRETE BLOCKS.

that a process which will turn out blocks in a few minutes or hours will lock up much less money in the construction and handling of molds than one which requires days for the concrete to set. Still another item is the saving in materials which can be made by making the blocks hollow. To compete with brick in strength it is not necessary to use all the material which it would take to make a solid block. A proper removal of material reduces the strength of the block but little, but there may be some increase in cost on account of greater difficulty of making the blocks with hollows. The machine which will make the hollow blocks equal in quality to the solid blocks nearest the same cost is the machine which comes the nearest the desired perfection.

It has been demonstrated that machines can turn out blocks which can be distinguished from natural stone blocks only on close inspection, and which will exceed in strength the good building limestones, so that the substitution of concrete blocks for natural stone and brick is a question only of relative cost, when public opinion, based on more general knowledge of the properties of concrete, places that material where it rightfully belongs in the list of building materials.

Another form for artificial stone, which is popular among the inventors at the present time, is that of the ordinary building brick. These blocks are by some inventors made of cement and sand under various processes, and by others of sand and certain silicates, combined under steam pressure and heat. The advantages of these blocks over common brick are appearance and strength, and perhaps cost, and over face brick, cost and uniformity and certainty of product. Ornamental designs are also more readily and more certainly produced.

The illustrations accompanying this article



COTTAGE OF HOLLOW CONCRETE BLOCKS.

ORNAMENTATION OF CONCRETE BLOCKS.

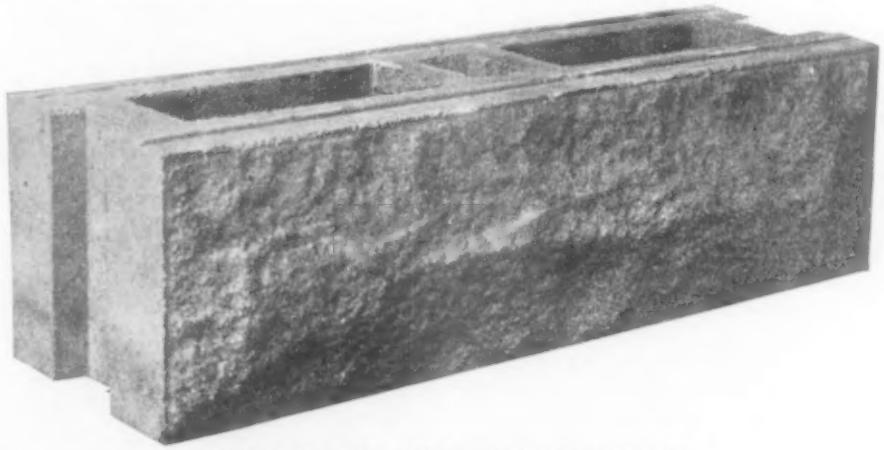
show the application of hollow concrete blocks to buildings in Terre Haute, Ind., by the American Stone and Conduit Company of that city. One view shows a store front, and gives opportunity for comparison of its appearance with the brick side wall of the building. Another view shows a cottage under construction with the blocks. The detail of the ornamentation in the string course at the top of the windows is shown in a third picture. This shows the ease with which quite elaborate ornamentation may be applied, the making of the ornamental blocks being little, if any, more difficult than that of the regular building blocks. Ornamentation costing many dollars for stone-cutters' work in natural stone can be applied for a few cents or without any extra cost.

A description of the Palmer block, used in these buildings, will show the points to be considered in artificial stone construction. The regular size of blocks used covers a wall surface equal to that of 40 bricks, and the wall is 10 inches thick, this thickness being more than equivalent in strength to a 13-inch brick wall. Each block is provided with a bead, which facilitates leveling each course as laid. One-third the volume of the stone is hollow, and these hollows can be so arranged that wiring and the smaller pipes for a building can be run in them out of the way and with greater safety. The hollow wall also conduces to dryness within the building. The ornamental courses can be run in as desired, and special forms of blocks for window and door casings, lintels, water-tables, and the like can readily be made. The inner surface of the blocks is prepared to receive the hard plaster coat directly, so that lathing and the first or "mud" coat of plaster are not required and studding is saved. It is said that four men can produce in one day with the Palmer machine enough blocks to lay a wall 10 feet high and 30 feet long, and the ornamental-faced blocks are turned out quite as readily with common labor as the standard forms. A little computation will show that with the ordinary proportions of cement and sand used in such work, the blocks can be put in the wall at a price which makes competition with common brick possible.

These blocks are made of cement and sand, both fireproof materials, so that walls and partitions made of them are far superior to natural stone or to concrete made with broken limestone. That they resist fire better than walls of common brick has also been demonstrated.

It seems hardly necessary at this time to compare cement constructions with stone or brick on the score of durability. This has been so thoroughly demonstrated by centuries of use, and for modern Portland cements by many years' exposure in walls, foundations, piers, culverts, arches, roofs, floors, and many other ways thoroughly testing their possibilities and their superiority to stone, brick, iron, steel and wood in durability, that the railroads, mine owners, builders of factories, warehouses and elevators are now making most of their new constructions of concrete. The largest railroad systems are constructing their culverts and smaller bridges of concrete, their excessive conservatism in regard to change of methods having been completely overcome by the demonstration of the superiority of cement and its low cost.

Cement blocks in structures ranging from the massive artificial stones in ocean piers,



PALMER HOLLOW CONCRETE BUILDING BLOCK.

exposed to the full fury of the elements, to hollow blocks in cottage walls, have been used for many years, and the adaptability of the material to such forms and the durability of such combinations has been so thoroughly demonstrated that such methods of construction are being rapidly adopted in all parts of the country. The present prospect is that cement as a building material will largely displace both brick and wood, especially for outside walls and floors, and will press terra cotta very hard for use in fire-proof partitions and in fire-proof coverings for beams and columns.

EDITORIAL COMMENT.

Street Railway Franchises.

The special committee of the Board of Aldermen of Chicago upon Local Transportation presented a report on December 11 outlining the provisions which it considers desirable in a street railway franchise renewal ordinance. The ordinance provisions will be found in our department of Current Information. The committee makes some comments upon the reasons for these provisions, which are worthy of special consideration. While some of the provisions are strictly applicable only to Chicago, nearly all will be serviceable in some form to other cities considering renewal ordinances, the differences being questions of degree rather than kind.

The committee leaves the question of municipal ownership open for two reasons—one that it considers the wisdom of municipal ownership an open question, and the other that under present laws the city councils do not have full power to provide for future municipalization. To leave the matter open for ready solution whenever desired, the committee recommends that, while the franchise may be granted for twenty years, the city should reserve the right to purchase at any time after ten years, or to require the sale of the plant to a company designated. This question of length of franchise is usually so connected with the questions of rates of fare and payments to the city for franchise rights that they should be considered together.

The committee proposes fares of six for twenty-five cents, and a payment to the city of a percentage of the gross receipts. Investors object to short terms of franchise, especially when they can be shortened indefinite amounts, unless the profits in sight are sufficient to offset the inconveniences. Any ordinary percentage of gross receipts paid to the city would still leave sufficient profit with the rate of fare and the other provisions proposed to warrant the short franchise term in Chicago. In small cities the difficulty of securing investors must be considered in this connection.

There are considerable differences of opinion regarding the propriety of requiring large payments to the city for franchise privileges, some taking the position that profits beyond a reasonable interest upon the money and talent invested should be divided with the users of the cars in the form of reduced fares. The principal reason given is that the profits come from the users of the cars, and not from the public at large, and that these patrons should receive the dividend rather than the tax-payers, who, in the case of the payment to the city, receive it in the form of reduced taxes. When it is considered that the small tax-payers and the non-tax-payers are in the large majority in the city, and as users of the railways, there seems to be much justice in this proposition, especially if the franchise also provides for street paving of the track areas. When the increase in general property values on account of the existence of the railway system is considered, good ground for the position is again found. The increase in city expenses on account of the running of cars, the difficulties with paving and drainage and the like, warrant the requirement of a contribution in the form of the payment of a fixed sum or a percentage of receipts into the city treasury.

With the publicity of accounts provided for in the proposed Chicago ordinance, it will be possible to incorporate a provision for readjustment of these questions at fixed times. It is quite possible that the percentage of gross returns proper at this time will be either insufficient or extortionate under future conditions. It is probable that a careful study of the facts brought out by this publicity in accounts will warrant a re-

adjustment of the relations of fares and of percentages of gross receipts, so that in ten years it would be advisable, for example, to reduce the fares somewhat and at the same time reduce the percentage to be paid the city treasury, leaving the actual return to the company the same as at present.

Municipal control is assumed in the report to cover matters pertaining to the construction and reconstruction of road-bed and plant and all matters pertaining to the furnishing and operating of cars. These matters are of the utmost importance to the patrons of the lines and to the city in the care of its streets, but the ability of the company to provide satisfactory service depends but little less upon the amount of interest on bonds and dividends upon stock which it pays than upon the amounts received for fares and the amounts required for providing the service demanded. It is advisable, therefore, to consider seriously the extension of municipal control one step further and to require approval by the city of issues of stock and bonds, that the capitalization of the company may be kept as near the actual investment as possible, and the concealment of profits by payment of interest upon "water" may be prevented.

There are so many complaints of railway managers that they are unable to make needed improvements on account of the necessity of meeting fixed charges, known to be based on other values than the cash investment, that this phase of the problem of municipal control should not be neglected. Then, too, the capitalization of the company should not include the value of the franchise. The city and the street railway patrons should not be expected to give the franchise to the company and then pay interest upon its value in the form of dividends on stock issued on account of the value of this franchise to the company, when proper control of stock and bond issues, combined with the publicity of accounts provided for, would result in reduction of fares and increase in payments to the city treasury at the same time that the service is kept at its maximum of efficiency.

A most encouraging recommendation of the committee is that proposing the reference of questions of down town terminals, routes, motive power, subways, track construction, and other engineering questions to a competent engineer or commission of engineers with full power to require compliance with plans prepared by such experts and approved by the council.

Stream Pollution Not Excusable.

When the movement against the pollution of streams began in England there was little prospect of immediate improvement in their condition. No one knew what to do, and a commission was appointed to consider the matter. This commission spent several years in investigating the condition of streams and the reason therefor, and made some progress in the line of treatment of effluents from manufacturing establishments and sewerage systems. The final reports are classics upon the subject, and formed the basis for nearly all the work that has been done until the recent biological discoveries revolutionized the treatment of the sewage. A very large part of the pollution existing at the time the commission began its work came from the manufacturing establishments. Chemical examinations were therefore in most cases very valuable in determining what treatment should be given the wastes to prevent nuisance and poisoning of the water. A public opinion which is antagonistic to such pollution of streams by manufacturing wastes has developed, until now it is at times almost too intolerant and makes requirements which are somewhat unreasonable. Undoubtedly an amount of pollution which would be permissible in one stream and under one set of conditions would be very objectionable in another stream or under other conditions, but this is not always considered, and the more stringent regulation is applied to all cases.

With the possible exception of highly putrescible factory wastes, the most objectionable pollution of streams is from sewage. The early work of the commission and of those working upon the lines laid down by it was based upon the same sort of chemical examinations and chemical processes which were both theoretically and practically applicable to most factory wastes. These processes all attempted to stop the putrefaction of the organic matters in the sewage, to arrest a process of nature, and were unsuccessful from a financial point of view, because the resulting product must be disposed of in such manner as to produce no nuisance

during the continuance of the natural process, which is bound to come at some time.

When by the biological study of human wastes the principle of the true processes of purification of sewage was discovered, a new era in sewage purification began. Now, instead of attempting to arrest the process of disintegration, it is hastened as much as possible. Conditions most favorable to the work of the various organisms performing the work are studied, and are supplied as soon as discovered, the sewage is inoculated with the proper organisms and those unfavorable are eliminated. The engineer now has simply to provide these conditions and the work is done by almost invisible workmen. The cost of supplying the conditions has been greatly diminished since the first experiments were made, and is now so slight that there is no excuse for not spending the small additional sum necessary when a sewerage system is constructed if there is the least danger of injury to any interest by the discharge of an unpurified effluent.

So far as small systems are concerned, the success of the methods and the relatively small cost have been demonstrated. Whether large systems will be equally successful is not yet certain, though the experiments which have been made indicate that sufficient capacity of tanks and filters is all that is necessary to secure any desired purity of effluent, proper management of the works being assumed.

There is still room for much improvement in methods, and there is really but little known of the actual detail of the vital processes in the tanks and filters, so that some improvements in methods and some reduction in expense will undoubtedly be developed in future plants. It is very natural, therefore, for the larger cities, which must expend large sums in first construction, to evince much reluctance in placing their money in large plants which may soon be found less economical in operation than they should be and more expensive in first cost than is necessary. Each wishes some other city to pay the cost of the necessary experiments. It is only when a city is absolutely required to do something at once that any step is taken. Thus Manchester, England, is making an advance which every city in the world can profit by. There are several cities in this country which are rapidly approaching the same condition of necessity, and the first one to be forced into construction of a sewage disposal plant will, though unwillingly, be a great public benefactor, on account of the knowledge of the effect of American conditions upon the detail of the processes.

The continued pollution of streams by city sewage is none the less inexcusable, in view of these great advances in the science of sewage treatment of the last three or four years.

Water-Works Statistics. The committee of the New England Water-Works Association, appointed for that purpose, has slightly modified the blank form for summary of statistics of water-works systems formerly used and presents it as a convenient form for giving, in sufficient detail, data regarding cost of pumping, the totals of maintenance and construction accounts and of receipts from consumers and public funds, data regarding consumption and meters, and distribution system, both mains and services. The committee performs an additional service by issuing the forms printed on one side of each sheet of the usual form and size of annual reports, so that the blanks can be filled in and sent to the printer as a part of the annual report.

As an annual statement of the general results of the operation of water plants it is difficult to find a more satisfactory form than this. It asks for all the items which both public and private plants are willing to give and in sufficient detail for ordinary purposes, especially for small works. It does not differ, so far as it goes, from the form proposed by the committee of the American Society of Municipal Improvements. The latter goes a little more into detail, that all classes of works may find the forms suitable, and that the larger works may give the greater detail which is desirable for them. Forms for the detailed blanks, from which to take the totals called for by the N. E. W. W. form, are given, as they will be needed whether all the details are published or not; also forms for comparisons of results of various years. One valuable addition made by the A. S. M. I. committee is the analysis of the cost of pipe laid during the year.

Application to the N. E. Water-Works Association at 715 Tremont Temple, Boston,

will procure a copy of the form, apparently the only return desired being a copy of each report in which the form is used.

Water-works superintendents will benefit themselves in more than one way by using the form, and should avail themselves of the assistance so freely offered by the association.

THE QUESTION DEPARTMENT.

CLEANING SMALL SEWERS.

Can some one advise me where an appliance may be obtained suitable for cleaning sewers of stoppages? The trouble is always in our 6-inch pipes. The man-holes are 300 feet apart. I am using ⅝-inch pipe in 4-foot sections, which serves the purpose when the line is straight, but by reason of the curves, which are quite numerous, this method fails, and hence I am often compelled to dig and cut the sewer pipes.

J. B. White, City Engineer,
Pine Bluff, Ark.

Every engineer will be glad to know what device, if any, has been used successfully in such cases. The very frequent stoppages in 6-inch pipes has led most engineers to select 8-inch pipe as the smallest size for use in sewer systems. The great probability of stoppages occurring in curves in small pipe and the extreme difficulty of reaching such stoppages has also led to the rule that there shall be a man-hole at each change in direction, some engineers requiring changes in rate of fall as well as changes in horizontal direction to be made only in man-holes. Each difficulty with a stoppage is very likely to locate the place for a new man-hole, and the curves and small pipe will be found to be very expensive in the end on account of the numerous man-holes that will be found to be necessary.

In the absence of a device for cleaning out a complete stoppage, and as possibly obviating the necessity for a new man-hole, frequent flushing of the sewers by some of the means described in MUNICIPAL ENGINEERING from time to time may be used, care being taken to make the flushing stream large enough and rapid enough, as well as frequent enough, to wash away any incipient deposits before they have developed enough to produce a complete stoppage. Some causes of stoppage can not be removed in this way, such as tree roots and hard objects caught in bends or joints. Articles on pages 90 of February, 1898, 285 of May, 1898, 24 of January, 1899, and 395 of June, 1899, give methods of flushing by tanks and otherwise. In addition to the rods used, may be mentioned devices for concentrating the sewage flow, like a ball, "pill," a little smaller than the sewer, which can be drawn back by means of an attached line if it can not get through. This is, of course, of value only when the obstruction is slight, and must be used as a preventive of stoppages rather than as a cure. Curves in the sewer are inconvenient if the ball must be withdrawn.

CONCRETE SEWERS.

Can you give me or tell me where I can get some information as to the detail of construction of concrete sewers? *Subscriber, ——, Ohio.*

There is but little upon the subject in the text-books on sewers. Specifications are given in Folwell's "Sewerage" for cement pipe made in a factory and laid after setting in the same manner as other sewer pipe. The city of Washington, D. C., constructs concrete sewers under two specifications for concrete. These specifications may be sufficiently in detail to answer the purpose.

The materials are pebbles from fine bank or river gravel thoroughly screened, free from earthy or other foreign matter and small enough to pass through a ring $1\frac{1}{2}$ inches in diameter; clean, sharp sand free from mud, sewage, mica or other foreign matter equal to samples; fresh, clean water, free from earth, dirt or sewage; and Portland cement furnished by the city.

Mortar for concrete masonry, class A, is made of one part of Portland cement in perfect condition and two parts of loose, dry sand by volume; that for class B of one part cement and $2\frac{1}{2}$ parts of sand; thoroughly mixed dry and then enough water added to make a stiff paste, being turned over and mixed with shovels not less than six times, if mixed by hand, before the water is added. Mortar must be used within an hour after the water is added to it.

Concrete masonry of each class is made of the respective mortars and pebbles, the amount of mortar to be 25 per cent. in excess of the volume of voids in the pebbles.

The pebbles are drenched with water and added to the mortar in the proportions determined for the material in use, and the mass is thoroughly turned over not less than four times and mixed on a water-tight platform until every particle of the pebbles is completely enveloped with mortar, the work being done as expeditiously as possible.

Concrete is lowered to place in buckets,

carefully deposited so as to keep its even mixture and free from foreign matter, spread in horizontal layers not exceeding 5 inches in thickness, and at once thoroughly compacted by ramming.

Strong molds, forms and centers are used, made to fit the curves and shape of all the work and kept scraped clean from cement and dirt.

The back of every arch is thoroughly cleaned of dirt or loose or projecting mortar and smoothly plastered from the springing line to the crown with a coat of mortar ⅜-inch thick. The arches are allowed to set at least 24 hours before back-filling, walking or working on them or any weights are applied.

The back-filling is brought up evenly on both sides of the sewer so that no unbalanced pressure is brought upon the masonry. It is spread in horizontal layers not exceeding 6 inches in depth and thoroughly rammed.

Water must be kept out of the trench until the cement has set beyond the chance of injury.

In the larger sizes of sewers the advocates of iron or steel strengthening for concrete have successfully used the Monier, Hennebique, Ransome and other systems of rods or wire reinforcement imbedded in the concrete. Some of these systems are under protection of patents in this country and some do not seem to be.

WHERE CONCRETE SEWERS ARE IN USE.

Will you kindly tell me when and where sewers have been built entirely of concrete?

Harry V. Gifford, Toledo, Ohio.

The city of Brooklyn, New York, formerly used cement pipe for sewers to some extent but has discontinued their use. Concrete was also used to some extent. The city of Washington is now using concrete and cement pipe for sewers. Thos. Franklin, a contractor and engineer of San Antonio, Texas, reports the successful use of concrete for several sewers constructed by him. Reading, Pa., and Salt Lake City, Utah, have also used them. See answer on "Concrete Sewers" preceding.

CONCRETE IN BUILDINGS.

We wish to know where articles can be found upon the use of concrete in buildings. Our church society expects to build and is considering concrete construction. *A. T. Capen, Mattoon, Ill.*

But little has appeared in books or periodical literature upon the use of concrete in buildings, aside from a few photographs of work completed or under construction. A number of booklets of cement manufacturing companies and of owners of patents, on steel and concrete construction, are illustrated with similar views, and one or two go somewhat into detail on the methods of construction. Articles on the subject will be found in MUNICIPAL ENGINEERING, Volume XXI, July–December, 1901, as follows: Concrete Construction, Mixtures and Manner of Placing in Forms, pages 112 and 231; Concrete for Buildings, illustrated, page 214; Cement for Stucco and in Wall Plaster, pages 231 and 386; Concrete for Walls, Balustrades and Ornamental Work, page 329; Cement Bricks, Building Blocks and Forms, pages 78, 328 and 404; Concrete Basement Walls, page 337; A Concrete Dwelling, page 362; Cement Floors, page 405; also in this number.

CONCRETE VS. BRICK AND STONE MASONRY FOR BUILDINGS.

Could concrete be used in a two-story building to accommodate 75 to 100 horses on the second floor? How does it compare in strength, durability and cost with brick and stone masonry?

T. C., Hancock, Michigan.

Concrete can be used for such a construction with entire confidence. The strength depends upon the kind of materials and method of construction, but if properly put together should fully equal that of brick masonry, but might not be equal to that of good stone masonry. The durability of concrete also depends upon its structure. If first class it should be more durable than any masonry except of granite or such indestructible stone. Cost depends upon relative local prices of materials and labor. Where sand and gravel or broken stone are low in price, concrete is cheaper than brick masonry, but in some localities it may cost more than brick. It is usually cheaper than stone masonry.

NOVACULITE.

What is novaculite? *M. D. C., Chicago, Ill.*

Novaculite, in the words of Professor J. B. Johnson's report upon the material, is "an uncrystallized quartzite, being 98 per cent. pure silica and entirely free from lime or other alkaline substance. It is very much like flint, and occurs in large quantities in southern Illinois and Missouri, and at many places in Arkansas. As usually found in these localities, it forms the undecayed portions of a porphyritic rock formation belonging to the unstratified or primitive rocks, in conjunction with the granites. The softer ingredients of this formation have degenerated or decayed, leaving the silicious portions in a very much broken-up condition, more or less uniformly dispersed

in a cement-like matrix or bonding material, which is the decayed remains of the less permanent ingredients of the primitive rock. This quartz, or novaculite rock, is the hardest of the rocks; it scratches glass like a diamond, as can be shown by taking any specimen of it at random. It resists all disintegrating action of the weather. A novaculite fragment with corners rounded by exposure I have never seen."

In some quarries the proportion of the softer ingredients, mentioned in Mr. Johnson's description, is sufficient to form the bonding material necessary to compact the hard material into a solid, impervious wearing surface for roads, while in others there is not enough and a small amount must be supplied. The rock breaks up easily into fragments small enough for road use and is screened, the larger stones being used for foundations and the smaller for wearing surfaces of roads. Being very hard and capable of thorough compacting, it forms a very satisfactory road covering for all but the heaviest traffic.

BOOKS ON BRICK WORK.

Can you supply a book which treats of brick work from a contractor's standpoint, with data for estimating such work? I want such data for brick work as are given in the "Directory of American Cement Industries and Hand-Book for Cement Users," for cement construction.

E. R. Dillehay, Danville, Ky.

Maginnis's "Bricklaying" ($2) is the book answering most nearly to the statement of what is wanted. It is fully illustrated, and describes all the operations of bricklaying, including concretes and mortars, shoring and underpinning. It has two chapters giving many data regarding the quantities of ordinary materials required in building.

ASSESSMENTS FOR PAVING CORNER LOTS.

What is the usual method pursued in levying assessments for paving corner lots? Does the holder of the lot pay full frontage cost on both streets? If not, in what manner and how much is he released?

Frank Hamilton, Traverse City, Mich.

The principle upon which assessments are levied is that of relative benefits to property. The relative benefit of a street assessment can not be determined by the value of lot and improvements, for it may well be more in proportion to value for the unimproved lot than for one which is highly improved. The most common method of measurement of benefit of pavement is that of frontage on the improvement, though a few cities assess by area, and a very few by some combination of frontage and area. Where these methods are in vogue it is customary to assess the corner lots full cost for improvements on both streets, on the assumption that the value of the improvement to the corner lot is at least equivalent to these assessments.

In some states no other method of assessment is possible under the law. In Indiana, for example, under the Barrett law, street assessments were required to be made in proportion to frontage. The decision in the Norwood case in Ohio for a time cast a doubt upon the constitutionality of this method of assessment, but the final outcome of the discussions and conclusions from the various legal opinions seems to be that the method is correct, provided proper opportunity is given for modification in any cases where the rule is not strictly applicable. During the period of the discussion, several states modified their assessment laws, and it is now possible in such states for the assessing authority to modify the strict application of the frontage rule. The board of public works of Indianapolis has made two attempts to relieve what it considers the excessive burden of the corner lots under the strict frontage rule, the last distributing it so that the corner lots will be assessed 85 per cent. of the amount under the frontage rule, the other 15 per cent. being assessed equally upon the frontage of the next three lots on the street intersecting the street improved.

Even when the corner lot has several houses upon it, it will probably be considered equitable to relieve it of some small part of the double assessment arising from the two street improvements. The application of the frontage rule, with careful modification for a few special cases which may arise, will probably give the greatest satisfaction to the tax-payers. There is no fixed rule which does not work injustice occasionally.

COST AND LIFE OF SIDEWALK MATERIALS.

As an addition to the article in this department last month under the above heading, Mr. George C. Warren, general manager of the Warren Brothers Company, Boston, Mass., presents the following upon the subject of bituminous concrete sidewalks, which is illustrated by four reproductions of photographs of existing work:

"In the December number of THE MUNICIPAL ENGINEERING, page 406, appears an editorial reply to an inquiry regarding the cost and life of different kinds of sidewalk materials, which gives only a passing reference to 'tar walks.' This only voices the generally popular sentiment except in New England and a few other localities that side-

walks made of tar or compositions made from tar are hardly worthy of consideration. This is due to the fact that in most sections of the country where tar walks have been laid at all, 'any old' tar laid in the most haphazard manner has been regarded as good enough, with the result that the walks have quickly disintegrated and naturally led to rejection of this class of walk as unsuitable. It would be as reasonable to reject, in general as unsuitable, Portland cement concrete sidewalks because, in many instances where the work has been done too cheaply or with improper cement or other material, or otherwise improperly laid, the results have not been successful, as it is to reject bituminous concrete sidewalks because they have been unsatisfactory in many cases. A careful study of the matter proves that when carefully selected tar is properly treated to make the sidewalk composition, and the ingredients are carefully and scientifically selected and manipulated, there is no class of sidewalk which gives greater economic value than bituminous concrete, in which a composition prepared from coal tar is used.

"In New England, and especially in the vicinity of Boston, which section is noted for its fine walks and pavements, this has been the most popular walk for a quarter of a century. The city of Newton, which is a residential suburb of Boston, with a population, according to the census of 1900, of 33,587, and known as the 'Garden City of Massachusetts,' has been using bituminous concrete walks almost exclusively for thirty years, and during the past three years has laid upwards of 600,000 square feet or about 25 miles of it.

"In general the work in New England has been superior to that of other sections, but enough poor work has been done to show the importance of employing scientific skill and experience in the selection and manipulation of materials used in the construction.

BITUMINOUS CONCRETE WALK, THIRTY-THREE YEARS OLD. NO REPAIRS. TAUNTON, MASS.

"I inclose photographs of bituminous concrete sidewalks taken during the present year in Newton, Brookline and Taunton, Mass., which have been in use from 20 to 33 years.

"The walks can be laid with reasonable profit in the most approved manner at from 7 cents to 9 cents per square foot, depending on the local cost of labor, sand and gravel. If cities do their own work under proper

scientific guidance, they can lay the work at considerably less cost than this. The necessary plant for heating and mixing ingredients and rolling the concrete costs about $200.

"When the one-inch wearing surface is worn through, which will not occur for many years, it can be renewed at about half the cost of the original walk and the resurfaced walk be as good as new.

"Even the best coal tar or 'gas tar' should never be used, as they contain impurities which are objectionable. Mixtures of the best coal tar and the best pitch, which are sometimes used, are much inferior to a properly and scientifically prepared composition made to just the right conditions for use."

Mr. Warren's experience and observation enable him to speak with authority upon this class of sidewalks.

BITUMINOUS CONCRETE SIDEWALK IN CHESTNUT STREET, WEST NEWTON, MASS.

CONSTRUCTION OF SIDEWALKS BY CITY.

Could you give me the names of cities where the so-called Toronto or Ohio plan of building permanent walks and pavements is in use, viz: where the city lays all the walks of stone, brick, cement or other permanent material and collects from the abutting property owner, giving a term of years to pay for the work? Our charter commission is discussing the plan and wishes some information.

Thos. J. Wanek, Albert Lea, Minn.

For more than ten years, since the so-called "Barrett Law" was passed, this has been the legal method of procedure in Indiana cities. It is also in use in Nebraska, Illinois, Iowa, Michigan and other states. Information regarding its practical working in any city in these states can be obtained from the mayor or city clerk. It is unquestionably the most satisfactory method of constructing such pavements and paying for them. Where the sidewalks are left to the care of the property owners there is a lack of uniformity in material and workmanship, which has a very unfavorable effect upon the condition of walks. They do not correspond in material, grade, width or form, and are both unsightly and inconvenient. Work done under private contract is much of it slighted on account of the ignorance of the property owner as to what is good work. Even if the work must be

done under the supervision and the specifications of the city engineer or other city official, or to surveys made by him, there is not much improvement. Uniformity in quality and appearance, conformity to established grades, excellence of material and construction are all under much better control when the work is done by contract with the municipal authority and under its plans, specifications and supervision. This

the described boundaries which are already sufficient. After due advertisement of hearing and opportunity for remonstrance the resolution is modified, if necessary, and finally adopted. Ten days is allowed for each of these steps. A majority of the property owners, or of the property owners resident on the line of the improvement, or two-thirds of the same, can stop proceedings by presenting remonstrance at the

BITUMINOUS WALKS IN THE REAR OF THE RESIDENCE OF THE LATE PROF. CYRUS M. WARREN. BROOKLINE, MASS. THIRTY-TWO YEARS OLD. NO REPAIRS.

is the report from all who have tried both methods.

An abstract of the procedure based on that under the Barrett law will show the general plan of carrying out the work. The first step is the resolution declaring the necessity of the work and describing its character and extent. This resolution may be based on a petition from a majority of property owners, or under some laws originates in the city council or board of public works having control of the matter. It should give authority for omitting any walks within

time set. Each of the provisions mentioned will be found in use somewhere. When finally adopted, bids are advertised for on plans and specifications then prepared, or in some states presented with the original resolution by provision of the law. The contract is let and the work proceeded with. There is considerable difference in the method of paying for the work. Under the Barrett law in Indiana the cost of doing the work was assessed upon the property abutting, and the property owners were given thirty days in which to pay cash or elect to

pay in ten annual installments. The contractor receives all cash which is paid in and the bonds which are issued for the deferred payments, which may be liens upon the individual pieces of property or may be issued by the city. In either case they are gradually extinguished by the annual payments of one tenth the principal and the interest. The latter method seems to be the most satisfactory for both tax-payers and contractors. In case a guaranty is required, bonds sufficient to cover it can be retained during the guaranty period.

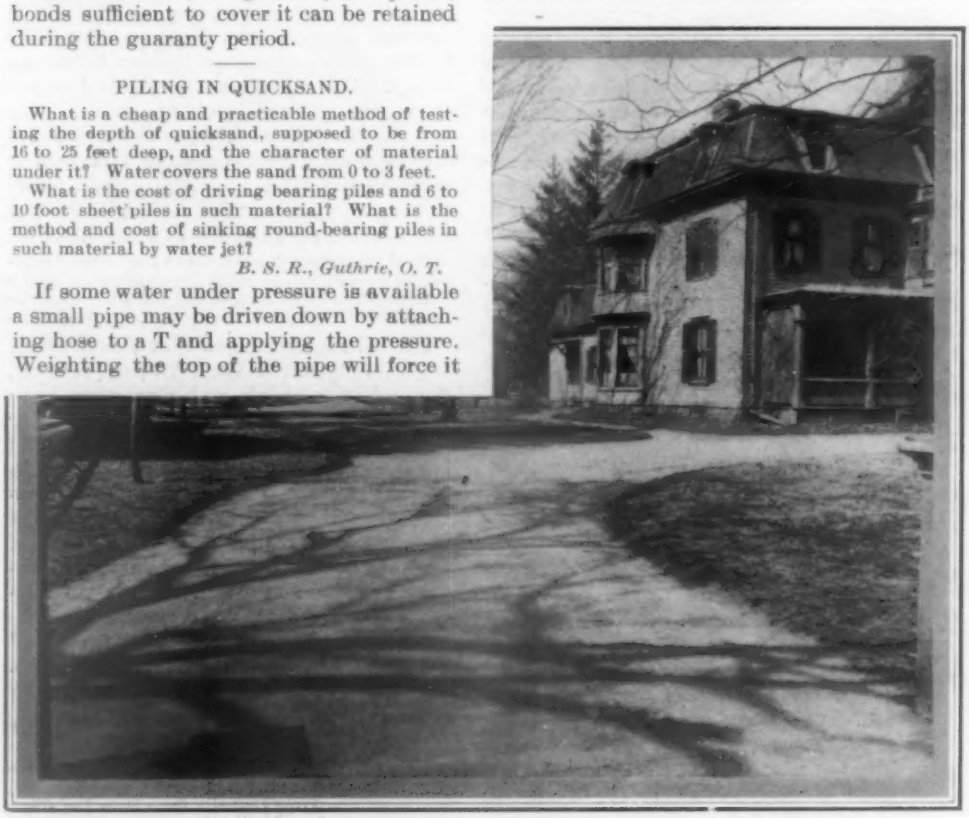
PILING IN QUICKSAND.

What is a cheap and practicable method of testing the depth of quicksand, supposed to be from 16 to 25 feet deep, and the character of material under it? Water covers the sand from 0 to 3 feet.

What is the cost of driving bearing piles and 6 to 10 foot sheet piles in such material? What is the method and cost of sinking round-bearing piles in such material by water jet?

B. S. R., Guthrie, O. T.

If some water under pressure is available a small pipe may be driven down by attaching hose to a T and applying the pressure. Weighting the top of the pipe will force it down as the sand is loosened by the flowing water until the bottom is reached. Sections may be added below the T as needed. Then a few blows with a hammer of sufficient weight will force the end of the pipe into the stratum below and a core of the material may perhaps be brought to the surface. If large enough pipe is used, the sand can be removed from inside the pipe, as it is driven down, by a sand pump, and if the substratum, when reached, is too hard to be touched by the pump, it may be loosened with any convenient tool and then brought up by the sand pump, or the water may be pumped out and an ordinary auger inserted and a good sample obtained, if the stratum is not rock. This method is more certain of success than the first, on account of the less danger of washing out and losing the sample on its way to the surface. If a smaller pipe or rod can be inserted, in the first case mentioned, some indication of the character of the substratum can be obtained from what can be made to stick to the rod or pipe, and more than one trial can be made with one driving.



BITUMINOUS CONCRETE DRIVEWAY AT RESIDENCE OF MR. M. F. ROLLINS, NEWTONVILLE, MASS. LAID IN 1880. NO REPAIRS.

An estimate of the cost of driving bearing piles with a hammer in such material is difficult. Under some conditions piles will be easily driven, while under others it has been found that a pile would not drive more than 0.1 inch at a blow. Cost of driving may range from about 1 cent to 10 or more cents per foot of pile driven according to character of soil and method used, the lowest cost being for water jet in loose soil. Cost of material, delivery and apparatus

must be added. Similarly, sheet piling will vary in cost, probably within outside limits of about $12 and $20 per thousand feet board measure of piling used, with timber at $10 a thousand.

The method of sinking bearing piles by water jet consists in attaching a pipe to the lower end of the pile, which accompanies the pile down and is served with water under pressure by hose or other convenient means attached at the upper end. The lower end of the pipe is bent toward the center of the pile and a suitable nozzle is attached to enable the water by its volume and force to wash the sand from below the pile, thus permitting it to sink. Sometimes two pipes and jets are used for long piles where some hard material may be encountered. The amount of water necessary is estimated from actual work done as 16 gallons per minute for each inch of average diameter of pile for 40 feet depth, with an increase of 4 gallons for each 10 feet additional penetration. The Edson pile-sinking outfit for light work is said to be able to sink for wharf purposes from 30 to 50 piles of 6 to 12 inches diameter per day with three men. The lower figures in the statement of cost of pile driving given above are for the water jet method.

INFORMATION ON ASPHALT.

Kindly let me know the price of Greene's "Natural Uses of Asphalt."

Ernest Belanger, Assistant City Surveyor, Montreal, Canada.

Greene's paper on "The Nature and Uses of Asphalt" is probably the publication referred to. It was presented before the Society of Arts of the Massachusetts Institute of Technology at Boston, and is an excellent short statement of the matters included under its subject. The Barber Asphalt Paving Company, 11 Broadway, New York, can doubtless furnish copies of it, probably without charge.

ECONOMICAL DRAINAGE PUMPS.

Is there a better pump than the centrifugal pump for pumping over a levee the drainage from a district rapidly enough so that the area will not be overflowed? The probable maximum capacity required would be 25,000 to 30,000 gallons a minute, and the maximum lift 20 feet.

Reader, ——, Ind.

Undoubtedly a piston pump would be most economical for constant delivery of this amount, but pumps of this capacity would cost so large a sum that the interest on the cost and the labor and expense of keeping the machinery in order would far overbalance the saving in fuel over a centrifugal pump for the time necessary for it to run. This is because it is doubtless not necessary to run the pumps until the river has risen above a stage which it holds but a small portion of the year, and because the maximum capacity will be required only when there is a combination of a high stage of water in the river with a heavy rainfall, a very infrequent occurrence. The decision as to what is the best pump for the particular case must be made from a study of the circumstances and a comparison of the first cost and of the relative economy of running for the periods of time estimated to be necessary. The case is so strong in favor of the centrifugal pump, however, in this class of work, that the decision will be reduced to one between different designs of rotary or centrifugal pumps.

LIGHTS AT RAILROAD CROSSINGS.

What municipalities in Indiana have passed ordinances compelling the railroads to place arc lights at their crossings of streets, and what has been the result? *A. M. Barron, Bloomington, Ind.*

Special inquiry shows that South Bend, Laporte, Hartford City, Brazil, Elwood, Bedford, Alexandria and Hammond, have such ordinances and no trouble in enforcing them. New Albany, Crawfordsville, and Logansport as well as Bloomington have trouble in enforcing ordinances. Connersville had an ordinance the enforcement of which was defeated upon technicalities. Washington has tried to pass such an ordinance several times but has not yet succeeded. There is no ordinance on the subject at Greensburg, but the railroad pays for two lights of the seven at crossings.

TERMS OF FRANCHISE FOR STREET RAILWAYS.

Scranton is a city of 103,000 population, which has recently entered the list of cities of the second class. We have before our councils franchises for street railways. Will you kindly give us some information as to the length of time given in cities of this size in franchises granted? We would also like to know what revenues cities of this size receive for franchises given and what tax is imposed on said railways. *E. L. Merryman, Scranton, Pa.*

An article on Interurban Railway Franchises in Indiana, on page 218 of MUNICIPAL ENGINEERING for October, 1901, gives incidentally the terms of franchises for local street railways in several cities of that state, none of which, except those for Fort Wayne, had sufficient consideration before passage to make them worthy of acceptance by others. Most of the provisions of the Fort Wayne interurban franchise are equally applicable to local lines, and they are more than usually complete, showing the effects

of careful study of the questions involved. The provisions of the Indianapolis contract are not quite so directly applicable to local lines but are equally well constructed.

Almost every franchise granted during the past ten years for local or interurban railways in cities approaching the size of Scranton has been for a limited term of years, and there is an increasing tendency to require some payment in return for the grant. In Ohio the period is 25 years, as in Dayton, Sandusky, Lima, Ashtabula, Marietta, Springfield, Youngstown. In Illinois it is 20 years in Elgin, Galesburg, Moline, La Salle, and 30 years in Danville, but one Elgin franchise is for 50 years. In New York the old fashion of unlimited or long term franchises has not been changed; in Texas, Fort Worth has a 99-year term, Houston 35 years and San Antonio 40 years; in Michigan, Grand Rapids, Port Huron and Marshall have 30 years; Kansas City, Mo., has 25 and 30 year franchises and St. Louis 40 years; Portland, Me., Salt Lake City, Utah, Fairhaven, Mass., and San Francisco, Cal., have 50 year franchises, but a provision in the new charter of the latter city limits all future franchises to 25 years, and the road becomes the property of the city at the end of the term. Richmond, Va., limits franchises to 30 years and Erie, Pa., to 25 years. It is understood that Wisconsin franchises are now limited to 21 years.

Many franchises require paving between rails and tracks and a few inches outside to conform with street pavement, and a very few require the entire street to be paved by the railway company. Few require other payments. In addition to those named in the article on Indiana franchises may be mentioned Dayton, Ohio, which requires construction and repair of bridge and payment to the city of $50 a year for the first 10 years and $100 a year for the last 15 years of the franchise term; Ashtabula, which requires 0.1 of 1 per cent. of the gross earnings, Corning, N. Y., requiring $150 a year for maintenance of bridges; Elgin, Ill., which received $10,000 in cash, partly for increase in bridge and the filling of certain streets; San Francisco, which, under the new charter, will require 3 per cent. of the gross receipts for the first 5 years of the franchise term, 4 per cent. for the next 10 years, and 5 per cent. for the last 10 years, and Marshall, Mich., which requires $5,000 a year for street paving and 8 tickets for 25 cents. As examples of large prices bid for franchises when put up at auction under circumstances making bidding free and open may be named New Orleans, where $700,000 cash was bid in 1893 for a franchise not usable until 1906, equivalent to $1,246,000 at the time the franchise becomes available, and Kingsbridge, now in the city of New York, where the highest bid was $250,000 cash, 41½ per cent. of the gross receipts for the first year and 43½ per cent. thereafter. Six tickets for 25 cents and 25 tickets for $1 are required in several franchises, apparently without any regard to what other requirements are made.

In but one or two instances, and none of these recent, are the street railways relieved in the franchise of the payment of any part of the taxes upon their property, levied under the state laws as upon other real and personal property. In Illinois the companies may now be taxed upon their capital stock as well as upon the property they own. Reference may be made to the article in our Current Information Department in this number, in which the granting of franchises in Bloomington, Ill., is discussed.

CORRECTION OF BAD ODOR AND TASTE IN WATER—WATER-WAY OF BRIDGE.

Our present bridge has a water-way 4 feet deep by 12 feet wide, and 30 or 40 feet below the bridge the stream is 31 feet wide with depths at quarter points of 2, 2½ and 2 feet respectively, near the point where it is delivered to a factory where the water power has 31½ feet head. Which of the following waterways for a proposed new bridge would deliver the water most satisfactorily to the factory; one 4 feet deep by 20 feet wide, or one 5 feet deep by 16 feet wide?

We have complaints at certain times through the summer of a fishy, unpleasant taste and smell in the water supplying the town. Some attribute it to the fish in the lakes, others to eels in the mains. By microscopic examination I find a large percentage of organisms, chiefly the polyzoa, with some rotifers and hydras in the material taken from the screens. The two lakes from which the water is taken have together an area of 162 acres. In many places there are shallows along the shore with aquatic vegetation. What is the probable cause of the fishy taste and how can it be remedied? Where are there similar cases?

W. L. Bishop, Supt. Streets and Water-Works, Dartmouth, N. S.

Enough data are not given for basis of answer to the first question. At ordinary stages of water either water-way would doubtless be satisfactory. In times of flood plenty of water will be delivered to the factory by either opening, but the effects upon the bottom of the stream might be quite different. Character of bottom, velocity of water, obstructions in channel, etc., will all affect the question, and survey and expert examination would be necessary to decide it definitely, if it is important enough to justify the trouble and expense.

Fishy odors of general occurrence in a water supply are due to low forms of vegetable and animal life. The effect of

fish in stagnant water or of dead fish or eels is very local, and not observed far from the decaying body. Whipple's "Microscopy of Drinking Water" ($3.50) gives full treatment of this subject from the standpoint of the analyst and observer. He reports four varieties of Chlorophyceae and six or seven varieties of Protozoa which have been demonstrated by various observers to produce fishy odors or tastes. Most of these pass through the stages when their effect is noticeable in the spring, summer and autumn months, some varieties having two periods of maximum effect. Nearly all produce an oily secretion, in some cases strong enough to be noticeable while the plant is alive, but in most instances reaching the point of nuisance only during the period of decay. Bad odors and taste are sometimes produced by the fermentation of organic matter in the bottom of artificial reservoirs not properly cleared before filling, and the same so-called "purging" is also observed in small lakes fed by streams which bring down deposits of organic matter.

The remedy in the latter case is the catching of this matter in a small basin at the inlet of the stream, where it can be removed readily when the flood has passed and thus kept out of the lake.

The remedy for the growths in the reservoir or lake is not so readily stated. A few reports of attempts at applying remedies which have been more or less successful may be mentioned.

At Syracuse, N. Y., there was trouble in the distributing reservoir, lined with concrete, but not in the lake which is the original source of supply. The city was supplied directly while the reservoir was emptied and cleaned the first time. In subsequent years the fine floating organic matter found was skimmed off each day, light wind usually making this possible by men along the shore. Being thus removed before decomposition the matter imparted no odor to the water.

In San Francisco and Oakland reservoirs the trouble was attributed to decomposition of organic matter in mud deposited by the inflowing streams. San Francisco water flows some distance in open channels on its way from the reservoir and was improved in quality, while Oakland water flows in pipes and its quality deteriorated still more. Fine cloth screens, cleaned frequently, had some effect by removing floating matter which might otherwise decompose in the mains. Sand filtration at the Oakland reservoir is not entirely successful on account of the deterioration in the long supply main 9½ miles. A centrifugal pump was used to remove the mud from the bottom of the reservoir and discharge it below the dam.

In Brooklyn, Professor A. R. Leeds found aeration inapplicable, though under some conditions it is a valuable aid. Filtration would remove the matter but not prevent its return in the filtered water reservoir. By-passes were not there available on account of the possibility of imperative call for use of a reservoir during the time of passage of the odorous stage. He recommended covering the reservoirs as the only effectual remedy, thus preventing the growth of the organisms having most effect. Much of the Brooklyn water is pumped from driven wells into the reservoirs, where it is mixed with water from streams and ponds.

At Quincy, Ill., a reduction in depth of water in the reservoir to 10 feet was sufficient to prevent the growth of the objectionable organisms, the other varieties then appearing being easily removed and producing less noticeable effects.

At Denver, Colo., roofing of reservoirs with open spaces running north and south, the roofs being about four feet above the surface of the water, prevented growths.

At Lexington, Ky., aeration and filtration are successful, the filtered water basin being covered.

C. B. Brush found aeration sufficient in one case.

Treatment of water with ozone is proposed by certain German and American chemists, who have devised methods of making and applying the ozone, and report success in purifying water polluted as described.

Many other cases might be cited. Massachusetts has investigated this question more thoroughly than any other state, and is more generally supplied with water from reservoirs than most other states. Of 71 supplies taken from reservoirs and ponds 45 have trouble with bad tastes and odors, and in about 30 places this trouble has been serious.

The whole discussion is as yet insufficiently supplied with facts to make any formulation of general rules possible. Expert examination of the organisms actually appearing will furnish data for some recommendations of measures of relief. Often these can only be experimental, owing to the undeveloped state of the subject, but those who have carefully studied the organisms and experimented upon the conditions affecting their life will doubtless in the long run render more satisfactory service at less

cost than experimentation without such direction.

USES OF PORTLAND CEMENT CONCRETE.

In your last January and February numbers I noted what you have to say concerning the uses of Portland cement concrete. Has the information referred to been collected and published?

B. J. Ashley, Chicago, Ill.

In May the "Directory of American Cement Industries and Hand-Book for Cement Users" (85) was published, collecting all the information on tests and uses of cement and specifications for the same, as well as much other information on the manufacture of cement, and directories of manufacturers, dealers, users and supervisors of use, machinery and testing laboratories, etc. This book contains the information desired.

MAKERS OF PORTABLE HOUSES.

Can you give me names of persons making portable houses either in wood or iron?

J. J. McNamara, Boston, Mass.

The American Patent Portable House Manufacturing Company, Corona, N. Y., and the Knapp Portable Building Company, 190 W. 134th street, New York city, are two concerns in the east manufacturing portable houses. In Michigan there are also several firms, such as the Iron Cottage Company, Grand Rapids, Henry B. Lewis, 39 E. Atwater street, Detroit, and Mershon & Morley, Mershon Station, Saginaw, Mich.

HOT WATER FOR PUBLIC HEATING SYSTEMS.*

By C. W. Niles, Delaware, Ohio.

The system of furnishing heat to business blocks, hotels and residences from a central heating station is not a new one, but the application of hot water in a return system of heating is now receiving the attention of those in search of the best and latest improvement in public utilities, and is one in which economy of fuel and the wide distribution of heat at a minimum cost are worthy of attention.

The system as now in operation in a number of cities embraces a central heating plant located at, or near, the water works pumping station or an electric light station, where the waste steam can be utilized, from which radiate through the streets and alleys two lines of pipe of equal size, one for the outflow of hot water and the other for the return. These pipes are placed underground in properly insulated boxes side by side, taps of the proper size being made in each line for blocks and dwellings, which carry the water through radiators and to the central station by the return lines.

Pumps at the central station force the water through the outgoing lines of pipes, through the radiators, and back to the station under a pressure of twenty to thirty pounds—the return water passing through a larger heater into which the exhaust steam from the pumping station or electric light plant is discharged, or into which live steam is delivered from the boilers. The loss of heat from the pumps through the mains and radiators back to the heater has by experience been shown not to exceed twenty to thirty-five degrees, so that water sent out at a temperature of 190 degrees will be returned to the heater at an average of 165 degrees, and while passing through the heater is again raised to its original temperature by the exhaust or live steam. The plant of the Delaware Electric Light, Heat and Power Company at Delaware, O., has for four years furnished heat from a central station as above described (among others to the large buildings of the Ohio Wesleyan university). It has in that time encountered extreme cold weather, reaching 29 degrees below zero, and yet its patrons have been entirely satisfied and use no other heat. During the past year, under the supervision of the Gwynn Central Station Heating Company of Delaware, O., this system was extended to over two miles of mains, taking in the city hall, with 7,500 feet of radiation, through eighty-seven radiators, Hotel Donavin, court house and county jail—these being among the largest of ninety-five consumers who were on the lines during the winter of 1900-1901. The system gives a uniform temperature in all buildings at all times, without attention from the occupants and with the use of thermostats or other regulators, and, if properly equipped with radiators, can be maintained in all varying temperatures within 2 per cent.

To the consumer this means a constant and uniform temperature in offices and dwellings of seventy-two to seventy-five degrees through the winter—being regulated at the central station to meet the changes of temperature. If the weather

*From a paper before the Central States Water Works Association.

becomes colder the water is sent out at a higher temperature, and the speed of the pumps is increased; with nothing to do with fires or fuel through the entire winter, not even the turning of a valve to regulate the heat; whether the house is occupied or not, the plumbing and even the house plants are safe without the danger attendant on fires in stoves and dilapidated furnaces. It means freedom from dust, ashes and soot, with hot water for heat, electric lights, and gas for kitchen range. It means a reduction in insurance rates—to the personal knowledge of the writer, the insurance on one property was reduced 33 per cent. on account of the change from stoves to hot water heat.

Its superiority to steam-heating is recognized. It is a saving of fuel for the reason that the partially heated water is returned to the station with a loss of but little above that given out at the radiators, while a steam-heating plant will lose more heat, being under a higher temperature, and cannot be regulated so as to give the proper radiation in varying changes of weather. When the consumer becomes overheated the first thing is to open the windows and doors, thus wasting the heat that cannot be controlled. The loss is further augmented by discharging the hot water from the condensed steam at a temperature of 100 to 150 degrees into the sewer or waste-pipes, and this heat is lost. The combining of the units of heat at a central station from the exhaust steam that is usually wasted is a clear saving of fuel, and should the system require more heat than this, cheap fuel costing less than half the amount paid by individual consumers for lump coal can be used to supply live steam to the heater. In the use of slack and other cheap fuel at the central station we are able to send out to the consumer heat at a much less cost than he can generate for himself, to say nothing of the waste in old stoves and furnaces. Then, again, if you have exhaust steam to turn into the heater this is a clear saving of a waste product, which is at once turned into ready money, for it is just what the consumer wants. Plants of hot-water heating are now being constructed in several cities, and many delegations have visited the plant at Delaware during the past year, and in every case have recognized its advantages both to the consumer and owner.

The economy of this system of heating must be apparent to all, where the consumer can be furnished with heat, with all the advantages above mentioned, at a less cost than the fuel which he burns, with rooms constantly heated night and day, no dust or ashes, with no danger from fires and a less rate of insurance. To the company that furnishes the heat it means a saving of all heat lost in exhaust steam, which is a clear gain and at once becomes a marketable product and source of revenue, with little, if any, increased cost of operation, as the same force in the water or light station, with but little, if any, extra work can care for the pumps of the heating plant. The possibilities of this system are not only furnishing heat, but hot water for bath and domestic use, and even the pumping of ice water during the hot season through the radiators.

MUNICIPAL MATTERS IN COURT.

[Prepared for MUNICIPAL ENGINEERING MAGAZINE by Andrews & Murdoch.]

Approval of Contract—To create a lien for the cost of a street improvement in a city of the first class it is not necessary for the city council to approve the contract made by the board of public works, and it is immaterial that all of the work specified in the ordinance is not included in one contract, or that part of it is not let at all, unless it appears that the persons complaining were prejudiced thereby; and in that case the court has power to do justice by correcting the apportionment, or making such orders as the equity of the case demands. Joyce vs. Falls City Artificial Stone Company et al., 64 S. W. (Ky.) 912.

Assessment Against Abutting Property—The entire cost of a street improvement may be assessed against abutting property-owners, though the contractor, by his contract, guaranteed the workmanship and materials, and may, by reason of that fact, have increased the contract price. Horne et al. vs. Mehler, 64 S. W. Rep. (Ky.) 918.

Breach of Contract—Rights of Surety—A contract with a city for public work fixed a time by which the work should be completed, and provided that, if the contractor should fail to commence or proceed with the work to the satisfaction of the trustees having it in charge, such trustees should have the right, on notice, to declare the contract forfeited and cancel the same. The contractor entered into a contract with the surety on his

bond by which he agreed to indemnify the surety against any loss by reason of his default, and that in case of his default on breach of the contract the surety should be subrogated to his rights therein, and might use the contractor's property and equipment for the purpose of completing the work. The trustees declared that the progress of the work was not satisfactory, and after due notice declared the contract forfeited and annulled. They afterward permitted the surety to complete the work, in doing which it incurred a considerable expense above the price received. Held, that under the power given the trustees by the contract, their decision that the work was not proceeding satisfactorily and with reasonable expedition was conclusive on the contractor, in the absence of evidence that they acted fraudulently, and authorized his surety under the contract of indemnity to assume charge of the work, and that the surety thereby became his creditor for the amount of the loss it sustained, and entitled to maintain a petition against him in involuntary bankruptcy. Boyce vs. United States Fidelity and Guaranty Company of Maryland, 111 Fed. Rep. (U. S.) 138.

Cancellation of Contract—The fact that a city, without right, cancelled a contract for an improvement, and made a new contract with plaintiff by which the cost of the work was increased, does not entitle defendant, as against plaintiff, to any abatement of the amount assessed. Horne et al. vs. Mehler, 64 S. W. Rep. (Ky.) 918.

Care Required of City—The duty required of a city regarding the repair of its streets is reasonable care and diligence to keep them in reasonably safe repair and condition for travel. City of Salem vs. Webster, 61 N. E. Rep. (Ill.) 323.

Compromise of Joint Liability—A city against which and its contractor a judgment had been rendered, after a trial on the merits, in favor of plaintiff, for personal injuries, because of the negligence of the contractor in failing to guard an excavation, compromised its liability on the judgment in good faith after an appeal taken therefrom, the contractor also having appealed. The compromise was against the protest of the contractor, and made with intent on the part of the city to enforce it and hold the contractor liable under an indemnifying bond given by him on entering into the contract. Held, that the act of the city discharged its indemnitors so that it could not recover against the sureties on the bond. City of New York vs. Baird et al., 79 N. Y. Supp. 606.

Cost of Grading—Although a city charter, in authorizing the paving, etc., of streets to be paid for by special assessments, makes no mention of grading, yet a property-owner who petitions for the paving of a street and its grading preparatory thereto, to be paid for by assessments, will not be heard to object to the validity of an assessment therefor, after the improvement has been made, on the ground that the city had no legal power to include the cost of grading in such assessment. Loomis vs. City of Little Falls et al., 72 N. Y. Supp. 774.

Curative Statutes—The legislature may by a subsequent act cure irregularities in the proceedings of city officers in making local improvements and levying a special assessment therefor, where such irregularities might have been made immaterial by a previous statute, and such act will be effective, notwithstanding the previous rendition of a judgment declaring the assessment invalid because of such defects. Loomis vs. City of Little Falls et al., 72 N. Y. Supp. 774.

Damages for Cancellation of Contract—Where a city cancelled an advantageous contract for a street improvement and made a contract with another contractor whereby the cost, for which abutting property-owners were liable, was increased, the amount of such increase adjudged to them as damages against the city should bear interest from the date of the judgment against them in favor of the contractor. Barfield et al. vs. Gleason et al., 64 S. W. Rep. (Ky.) 959.

Defective Place for Sewer—A city is liable for injury to property resulting from the construction of a sewer according to a plan which is palpably bad, though the execution of the plan may have been skillful. City of Louisville vs. Norris, 64 S. W. Rep. (Ky.) 958.

Injury from Negligent Construction of Sewer—In an action against a city to recover damages for injury to property from the negligent construction of a sewer, it was proper to instruct the jury that "when the city undertakes to construct a sewer it is its duty to exercise ordinary care and skill to keep it in condition to carry off the water collected thereby from such rainfalls as may be reasonably expected to occur in the neighborhood to be drained by such sewer." City of Louisville vs. Norris, 64 S. W. Rep. (Ky.) 958.

Insufficient Designation of Material—A street improvement ordinance failing to specify the size or quality of the flat stones on which the curb stones are to be bedded is thereby rendered invalid. Nichols et al. vs City of Chicago, 61 N. E. Rep. (Ill.) 435.

Liquidated Damages—A stipulation in a contract with a city for public work for the payment of a fixed

sum per day for any delay in the completion of the work beyond the time stated, as liquidated damages, is not inconsistent with and does not abrogate a further provision giving the city the power to declare the contract terminated for delay in the progress of the work before the time fixed for its completion, and in such case the city has its election. Boyce vs. United States Fidelity and Guaranty Company of Maryland, 111 Fed. Rep. (U. S.) 138.

Notice Inviting Proposals—Street improvement act, section 5, provides that, before the awarding of any contract by the city council, it shall cause notice to be posted for five days inviting proposals, and notice of the posting of such notice shall be published for two days. Held, that a notice inviting proposals was not vitiated because the clerk of the city council, and not the city council, fixed the time within which proposals might be presented. Belser vs. Allman, 66 Pac. Rep. (Cal.) 492.

Notice of Defective Sidewalk—Knowledge of the officer or officers of a city charged with the immediate duty of repairing its sidewalks, of the insufficient condition thereof in respect to being out of repair after having been once properly constructed, satisfies the element of notice to the defendant of such insufficient condition, in an action against the city to recover damages for personal injury caused thereby, if such knowledge existed a sufficient length of time before the injury to have enabled the city, by the exercise of reasonable diligence, to repair the defect. Mauch vs. City of Hartford, 87 N. W. Rep. (Wis.) 816.

Reference to Plans and Specifications—The fact that an ordinance directed work to be done in accordance with plans and specifications on file in the office of the board of public works, when there were no plans and specifications on file, did not render the ordinance void. Horne et al. vs. Mehler, 64 S. W. Rep. (Ky.) 918.

Rights to Streets—Where a person contracted with a corporation to build gas works for it in a certain city, and the company guaranteed him the unrestricted access to the streets to lay pipes, his rights under the contract are with the company alone, and do not entitle him to be joined with the company as a corelator in an application for a writ of mandamus to compel the street and sewer department of the city to grant a permit to open certain streets for the purpose of laying pipes. State ex rel. Oxyhydrogen Company of Delaware et al. vs. Simmons et al., 50 At. Rep (Del.) 213.

Steam Roller Frightening Horses—Plaintiff's horse became frightened at the escape of steam through an automatic safety valve on a steam roller standing in the street about three rods from the horse, and plaintiff, in his attempt to control the horse, received injuries of which he complains. Plaintiff knew that the roller was in the street before going there, and the defendant was in the proper use of the street, and had complied with the statutory requirements of notifying persons approaching within one-eighth of a mile. Held, that the defendant was not guilty of actionable negligence, the escape of steam through the safety valve being incident to the ordinary operation of a steam engine. Rector vs. Syracuse Rapid Transit Railway Company, 72 N. Y. Supp. 745.

Sufficiency of Ordinance—The fact that an ordinance for improvements did not specify the material to be used, except to designate it as vitrified brick, did not render the ordinance void. Horne et al. vs. Mehler, 64 S. W. Rep. (Ky.) 918.

Termination of Contract—Under a contract with a city for public work which gave the city the power to terminate the same if not satisfied with the progress of the work, in case the delay continued after ten days' notice to the contractor, such notice was not required to contain a positive statement that a forfeiture would be declared; nor could the contractor object that a forfeiture was declared within ten days after the notice was given, where in the meantime he had entirely abandoned the work. Boyce vs. United States Fidelity and Guaranty Company of Maryland, 111 Fed Rep. (U. S.) 138.

CURRENT INFORMATION.

Street Railway Franchise Question.

In a recent issue of the Pantagraph of Bloomington, Ill., is a communication from W. R. Bach, former city attorney, upon the subject of the proposed grant of a franchise to a new interurban road and an accompanying extension of the franchise on one of the lines of the local street railway, which considers the local form of the usual questions in a manner full of interest to the city officials who now have or will shortly have similar problems to solve.

After showing the financial condition

of the city and the need of additional revenue, he notes the proposition to exact compensation for franchises granted to public service companies in the form of a percentage of gross receipts and continues:

Such a plan is feasible in our city. Already some of the public service corporations in the city contribute free service to the city in lieu of cash. The tendency of the later franchises in Bloomington has been in that direction. Such a policy is right so long as the service given is a necessity to the city.

I do not mean to be understood as casting any stones in the way of the new interurban railway. Let it receive the same fair treatment that all other public service corporations have heretofore received. But I do not think it right or proper that under the guise of admitting the said Interurban Railway Company into our city, that it should also be attempted at the same time, to grant a new and indeterminate franchise to the Bloomington & Normal railway on Washington-st., without such compensation to the whole people as the granting of such a valuable franchise should bring.

The street railway is no longer a financial experiment in cities of this size, especially when located on such a prominent street as Washington-st. The owners of the W. Washington-st. line could well afford to pay a percentage on its gross receipts for an extension of its franchise for a reasonable length of time.

Then, too, both companies could well afford not only to pave the portion of the street to be occupied by them, to-wit: seventeen feet, but also to pay the cost of widening the present pavement on Washington-st. west of West-st. to forty feet, made necessary by the double track and to pay for a new pavement on said street.

It is not right to compel the abutting property-owners to again pay for a pavement on Washington-st., having already paid for two, nor is it right that the city at large should pay for the same, especially the increased width, and at the same time give to the companies free of charge franchises worth thousands of dollars. A dangerous precedent would be thereby established that would ruin our city if adhered to.

It may be argued that the owners of the street car system pay taxes on said property already, and that they should not pay for this valuable franchise on that account. Now, on this point, in view of the recent decision of the supreme court, it might be well for our citizens to know just what taxes the street railway systems are paying on all their property, capital stock, and valuable rights in our city and Normal.

I wish to make the following statement, founded upon my investigations, towit. That the Bloomington & Normal railway under the law, should pay just twice the taxes that it now does, considering the value of the tangible property, both real and personal, and its franchises and capital stock, all of which are legally assessable.

The basis of the foregoing statement is the following statement of facts:

The entire street railway system now operated, with little changes, except that it was in a terribly run-down and dilapidated condition, was sold some three years ago to the present management for a few thousand dollars in excess of $200,000. When a short time thereafter it was reorganized the entire property was capitalized at $250,000, against which capital stock $250,000 in bonds were issued by the new company.

Its earnings have since been steadily and completely applied to the payment of interest on bonds that have since been issued by the new company and in the improvement and betterment of the track, road beds, rolling stock and extension of the lines; so that at the present time conservative estimates of the value of the entire property are placed at $350,000 to $400,000. Recent sales of stock, together with the earnings of said company, fully justify such a statement of values.

An important item of this value is the item of franchises in the city of Bloomington, that cost nothing to obtain save the obligation to pay for the pavement of the part of this street actually occupied by the tracks. These franchises are worth at least $50,000, and there are persons now in the city of Bloomington who would be willing to pay that price for the same.

Now let us see what the present company pays taxes on. The following figures were obtained from the county treasurer's books of this county:

Total assessed value of entire property on which the company pays taxes in both towns, $32,409. This represents one-fifth of the real value, which, therefore, is $162,045. Total tax paid by the said company last year in both towns, $2,043.98. Thereby showing that the company pays taxes on $40,000 less property than it purchased, and that, too, when the value has increased at least $100,000 since its purchase. The company pays nothing on its franchise at the present time, but should under the recent supreme court decision.

In view of the foregoing facts it will be no hardship on this company to pay for an extension of its West Washington street franchise and others when they are extended.

This franchise, as it now stands, will expire by limitation in March, 1905, the ordinance for the same having been passed in March, 1885. So let it not be argued that the company has a franchise already and that their kindness in permitting the interurban to come to the center of the city should be thus rewarded.

Let the city as a whole reap the benefits of any new franchises and let them be sold for what they are worth, not given away.

Some Interurban Railway Franchises.

The uniformity in the nature of the complaints regarding the contentions of interurban railway companies and municipal corporations would suggest the possibility of greater uniformity in fran-

chise provisions and demonstrates the carelessness with which municipal councils grant valuable franchise privileges without adequate safeguards and provisions for compensation. A few reported in a day's mail may serve as examples.

South Amboy, N. J., is troubled because the franchise terms are not complied with, the line not being extended the full length required, construction material not being removed and the service being far below contract requirements. The proprietors of the road are not willing to comply with the terms of the franchise, claiming lack of business sufficient to warrant better service on this line. The council is now considering what step shall be taken next.

The Beaver Valley Traction Company was organized about one year ago to operate a number of small roads in and about Beaver Falls, Pa. In its first annual report it complains of delays in construction on account of failures to secure franchises on account of excessive demands of some of the borough councils of towns on its lines and also that it was obliged to pay for the privilege of double tracking some of its lines more than $70,000 in the form of paving between the rails and tracks in many boroughs and townships. Notwithstanding the many delays in beginning reconstruction and the breaks in traffic schedules on account of the work in progress, the increase in gross earnings was from $85,644.92 in the year ending Sept. 30, 1900, to $133,049.58 in the year ending Sept. 30, 1901, showing an increase of 50 per cent. However, there was a strike in 1900, but, compared, with 1899, in which there was no strike, the increase was about 33 per cent. Still greater increase is predicted when the lines are in working order throughout, the traffic is fully developed and the new parks and pleasure grounds begin to have their effect. These statements indicate that the borough councils were not taking away fair compensation for the capital, energy and skill invested in the company in making their paving requirements and that possibly those demanding further payments were entirely within the bounds of justice to the company and were properly safeguarding the rights of the people.

The city of Evansville, Ind., is granting a franchise to the Evansville & Princeton Traction Company on terms which fix the compensation definitely, although it is hardly probable that the development of the business of the company can be foretold. Single fares are to be not less than 5 cents, and no continuous trip is to cost more than 2 cents a mile. Twenty-five 5-cent tickets must be sold for $1. The company pays the city $200 a year for five years, $300 a year for the next five, and $400 for the next forty years to the end of the franchise period.

The County of Middlesex, N. J., grants a franchise to the Raritan Traction Company to cross the bridge over Woodbridge creek under proper provisions regarding construction and speed, upon payment of $1,000 in compensation, the expenses of the proceeding and the construction and maintenance in good order of the entire wearing surface of the bridge floor.

Proposed Street Railway Franchise Renewal Ordinance.

The committee of councils of Chicago appointed for that purpose issued on December 16, 1901, an outline of provisions which it thinks should be included in an ordinance granting renewals of expiring franchises to street railways. The following are extracts from the report giving summaries of propositions which are not strictly local in their character:

I. In any negotiations that may be had the desirability, from the operating point of view, of complete unification of management, should be urged. Within certain areas the companies receiving grants shall agree to use tracks and motive power jointly, when ordered so to do by the city council, to such extent and in such manner as the city council may direct. Each company receiving a grant shall obligate itself to arrange and rearrange its tracks within such area in such manner as the city council may from time to time direct. Each company must carry a passenger from any point on the lines of street railway owned, leased or operated by it to any other point on its lines for a single fare. Each company receiving a grant must agree to enter into transfer arrangements with other companies for the interchange of transfers so as to enable a passenger to ride from any point in the city to any other point in the city for a single fare. Provision shall be made by the city council to prevent abuse of transfer privileges.

II. It should be a condition of every grant that the company receiving the same shall proceed at once to put its road bed, plant and equipment in first-class modern condition, and it shall maintain the same in first-class modern condition and shall render first-class service for the full term of the grant. The company shall be subject to all general ordinances of the city relating to street railways now in force or hereafter to be passed. All work of construction, reconstruction and repair shall be subject to the supervision and approval of the commissioners of public works. All electrical work shall be subject to the supervision and approval of the city electrician.

All rails hereafter laid in streets paved with asphalt, granite, brick or wooden blocks shall be modern improved

rails of the type known as the grooved rail, as described in an ordinance of the city council passed June 11, 1900, and published on page 498 of the printed council proceedings for the year 1900-1901, or a modified type of same to be determined by the city council. And wherever a street occupied by rails of a different type than that hereinbefore described shall be newly paved or repaved with any material aforesaid then the company shall replace its rails on such street, or so much thereof as may be newly paved or repaved as aforesaid, with modern improved rails of the grooved type, as above described.

All tracks unused or not required by public interests shall be removed from the street by the company at its own expense on the order of the city council, and the street shall be left by said company in as good condition as it was in prior to the removal of such tracks.

All cars must be of the best and most approved style, finish and design. All cars must have center aisles and must be without running foot-boards along the sides. All cars must be equipped with electric push-buttons that shall be within the reach of all passengers. All closed cars must be vestibuled. All cars must bear appropriate and conspicuous signs, so placed as to indicate to observers from all sides of the car the route and destination. All cars must carry at night illuminated signs indicating the route and destination. All cars must be properly heated, lighted and ventilated. All cars must be equipped with the best and most approved style of brakes and fender devices. The company must take such reasonable precautions to prevent injury from electrolysis as the city council may from time to time direct. Adequate night service shall be provided, as may from time to time be ordered by the city council. The company shall at all times operate on all its lines a sufficient number of cars properly to accommodate passengers. All cars shall be operated singly unless otherwise expressly authorized by the city council.

The enumeration herein of special requirements or the mention of specific regulations shall not be held to imply the relinquishment by the city council of the right to make other requirements or regulations which but for such enumeration or mention it would have the right to make. And the city council shall specifically reserve the right to regulate such street railways. Such right of regulation shall include the right to regulate the running of cars and the headway, the right to regulate the laying down of tracks for street railways, the transportation of passengers thereon and the kind of rail to be used, the right to pass and enforce ordinances to protect the public from danger or inconvenience in the management or operation of such railways, and the right to make and enforce all such regulations as may be needful to the securing of adequate and sufficient accommodation for passengers and to insure their comfort and convenience.

The grant will be for a period of twenty years. The city council shall have the right, at any time during the second ten years of the grant, to terminate the same, upon not less than six months' notice, and to take over the property of the grantee suitable to and used by it for street railway purposes, (which value shall be taken to be the cost of duplication less depreciation), with 5 per cent. additional thereon as compensation for the compulsory sale, but there shall be no allowance for franchise values or other consideration whatsoever. In case of failure to arrive at a decision of the matter by mutual agreement, the value of the property so to be taken over shall be determined by three competent persons, one to be chosen in such manner as the city council shall direct, one to be chosen by the company, and the third to be chosen by the two thus selected. In case of failure of the two persons chosen as aforesaid to agree upon the third person within a reasonable time, then, upon the petition of either party in interest, and after notice to the other party in interest, said third person shall be named by the appellate court. If the city council, at any time during the second ten years of the grant, shall be of opinion that the grantee is not using the grant in the best interest of the public, and if at such time the city of Chicago shall not have received from the legislature the grant of authority and power necessary to enable it to take over said property and utilize it, then the city council may terminate the grant as aforesaid, and may authorize any other corporation designated by it for such purpose to take over such property upon paying therefor its full value as aforesaid, with 5 per cent. additional thereon, as above provided, such value in case of difference to be determined by three competent persons, one to be chosen by the buying and one by the selling company, and the third to be chosen by the two thus selected. In case of failure of the two persons chosen as aforesaid to agree upon the third person within a reasonable time, then, upon the petition of either in interest, and after notice to the other party in interest, said third person shall be named by the appellate court. At the expiration of the grant the grantee may be required to sell to the city or to any corporation designated for such purpose by the city council all of its property suitable to and used by it for street railway purposes, upon the payment of its full value, as above provided, to be determined as above provided, but without the above allowance of 5 per cent. additional. At the expiration of the grant, if the company shall desire and shall be denied a renewal, the city shall take over at its value as above provided, to be determined as above provided, but without the said above allowance of 5 per cent. additional, the property of the company suitable to and used by it for street railway purposes, or shall make provision for its taking over by some other company designated by the city council for such purpose.

III. Every company accepting a grant must agree that all its licenses, franchises or grants of permission and authority, from whatsoever source derived,

to lay down, maintain and operate street railways in the city of Chicago, shall expire or be terminable at the same time and in like manner as may be provided in such grant for the expiration or termination of the licenses or permission and authority by such grant given. In case a grant is made to any company overlying subordinate or leasing companies, the provisions of this section must be consented to, not only by the overlying company, but also by all of the constituent or underlying companies.

IV. No company accepting a grant as herein contemplated shall directly or indirectly sell or transfer its grant, or consolidate with another company, or enter into leasing or operating agreements with another company, except with the approval of the city council. For any violations of this section the grant shall be subject to forfeiture.

V. Whenever in the judgment of the city council the public interests require the extension of any line of street railway or the construction of any new line, the company when directed by the city council to construct such new line shall construct the same and operate said line as a part of its system.

VI. The cable form of motive power shall be abandoned. All cars shall be propelled by electricity or such other motive power as may be authorized by the city council. Within a district bounded by North-ave. on the north, Ashland-ave. on the west and Twenty-second-st. on the south no poles or overhead wires shall be used, and on all lines of raiway where the cable is now in use the underground trolley system shall be substituted for the cable system throughout.

VII. If the city shall construct or cause to be constructed within an area not larger than the area bounded by Chicago-ave. on the north, Halsted-st. on the west and Sixteenth-st. on the south, subways or tunnels for the accommodation of street cars, the companies operating cars in such area shall, on the order of the city council, operate in such subways or tunnels such proportion of their cars as such council order shall direct, and shall pay for the use of such subways or tunnels a reasonable rental.

VIII. If it shall be found practicable to have streets occupied by car tracks swept by car sweepers or sprinkled for their entire width by car sprinklers or to have street sweepings, garbage or other refuse removed by street cars at night, every company accepting a grant may be required by the city council to procure the necessary equipment and to render for the city any of the services aforementioned. A company required by the city council to render any such service shall receive therefor a reasonable compensation.

IX. The city shall have the right free of charge to place lights on all trolley poles that it may care to utilize for such purpose. The city shall also have the right free of charge to string city wires on such poles, but the stringing of such wires shall not interfere with the use of such poles by the company. All trolley poles shall be of iron or steel and shall be of neat and artistic appearance, and shall be equal in style, quality and appearance to the poles maintained by the city for electric light purposes.

X. The company shall fill, grade, pave and keep in repair, and sweep, sprinkle and keep clean sixteen feet of the way and eight feet where there is a single track. The company, at its own expense, shall also keep the said portion of all streets occupied by its tracks free of snow and ice. In removing snow and ice the company shall not be permitted to deposit same upon the portion of the street outside of such eight or sixteen feet, except temporarily with the consent of the commissioner of public works. The city council shall be the judge as to when a street needs repairing, and the company shall repair the portion of the street which by this grant it is required to repair whenever it may be ordered so to do by the city council, and in the manner ordered. And whenever the rest of the street not embraced in said eight or sixteen feet of width shall be newly paved or repaved then the company, as to said eight or sixteen feet, shall at the same time repave same with the same material and in like manner as the portion of the street outside of said eight or sixteen feet may be paved or repaved, or in such manner as the city council shall direct.

XI. City policemen and firemen in uniform and city detectives bearing cards signed by the general superintendent of police shall be permitted to ride free.

XII. The company shall make detailed annual reports to the city council, in accordance with forms to be prescribed by the city comptroller, giving full information on all such matters as may be from time to time specified by the city council. For the purpose of verifying such reports the books of the company shall at all times during business hours be subject to examination by the city comptroller or by some person duly authorized by the comptroller to make such examination.

XIII. Tunnel lowering.

XIV. The rate of fare shall not exceed 5 cents, with universal transfers, but tickets shall be sold at the rate of six for 25 cents and twelve for 50 cents. As compensation for the grant the company shall pay into the city treasury monthly a percentage of its gross receipts.

XV. The company shall save the city harmless from all suits, etc., growing out of the grant.

XVI. There shall be a provision for a fine or other penalty to be visited on the company for failure to comply in good faith with all the requirements of the ordinance. And for persistent failure to comply with the requirements of the ordinance the grant shall be subject to forfeiture.

High and Low Potential Wires in the Same Conduits and Manholes.

Capt. William Brophy, of Boston, Mass., read a paper before the last meeting of the International association of municipal electricians, in which he considered the advisability of running electric wires

carrying currents of high and low potential in the same conduits and through the same manholes. The paper says in part:

The plan adopted by the only first-class city now engaged in the construction of conduits and proposed by nearly all who intend or desire to build them is to build for the joint use by the owners of all classes of wires and cables, and the only company that I know of that has secured a franchise to construct conduits to rent to others intends to build them for joint occupancy of high and low-tension wires. To such joint occupancy determined opposition is made by some if not all of the owners of low-tension wires, and, in my opinion, such opposition is justifiable and the companies are not only serving their own interests but those of the public as well by such opposition. The reasons for such opposition are all good and sufficient, and I will try to state them as clearly as possible.

In conduits of this kind perfect and absolute control of the wires and cables contained therein cannot be maintained by the owners thereof, nor can absolute safety from injury, due to carelessness or ignorance of those not in their employ and whose actions they cannot control, be ensured.

When it is absolutely necessary to make repairs or changes in order to prevent interruption to the service, which may prove serious, or to maintain its reliability, long and vexatious delays may be caused because others may be in possession of the manholes for the same purpose; for instance, a sudden drop in the insulation resistance of a high-potential cable may be the forerunner of a breakdown and burn-out, which may be prevented by prompt action. This action can always be taken where separate conduits and manholes are provided for each company. A burn-out in a high-potential cable, particularly when it occurs in a manhole and near the bottom, is almost sure to result on the burning out of every cable of whatever name or nature contained therein, causing serious interruption to the different services dependent on them and great inconvenience to the public, to say nothing of the possible, probable and actual danger they are exposed to, which will be considered later.

In external appearance there is no difference between many of the lead-covered cables for high and low-potential service, and it is next to impossible to distinguish one from the other when placed in manholes or conduits. Should a workman employed by the telephone company, for instance, who happened to be unfamiliar with the disposition and arrangement of the cables in the manhole, cut into a railway or direct-current incandescent lighting cable by mistake, the effect to him would be startling, and should he be able to reach the surface of the street uninjured he might consider himself fortunate indeed. The effect on the cables could be told much better after the tremendous energy passing over them had expended its force in destroying them than it could be predicted before the accident. The melted copper, lead and iron and remnants of ducts and cable would bear silent but eloquent testimony to the destructive effects of electricity when let loose in large volume and under high or medium pressure. If this same thing were to happen to a cable carrying alternating currents at a pressure of 2,000 or more volts, if he escaped with his life he might be considered a modern miracle. It may be said that accidents of this kind might be prevented if the cables bore some distinctive mark or tag. My personal experience has been that rules of this kind are never strictly lived up to, are difficult to enforce and would not wholly prevent such accidents.

There can be but one excuse for building underground conduits and compelling joint occupation of the same by high and low-tension wires—economy and a desire to obtain the greatest revenue possible therefrom. Such a consideration should not weigh for a moment against the danger the public would be exposed to by the adoption of such a plan.

In the first conduits in Chicago were placed the arc light and the police and fire department wires. There were so many serious burn-outs that the latter had to be removed and placed in separate conduits.

Capt. Brophy thinks the method in use in Boston is best, giving each company the privilege of constructing its own conduits, under direction of the city authorities.

In a recent number of the Electrical Review Charles F. Hopewell, city electrician of Cambridge, Mass., states the other side of the question, in part as follows:

The engineering propositions that I desire to consider are three. These are the relation of the subject title to method of construction and method of operation of conduits, and the determination of what good engineering practice has shown to be a safe distance for the separation of ducts containing high and low-potential cables. It is good logic to say that if high and low-potential ducts can be laid within three inches or one foot of each other without danger, then it must necessarily follow that there is no advantage in placing them any farther apart—for if a thing is safe I can not conceive of its need to be any safer. There is a decided disadvantage, in one respect, in separating them, inasmuch as by so doing they occupy more space in the public streets, and therefore create a greater tendency toward interruption of travel on such streets.

Before considering this subject further I desire to clearly set forth the difference between an explosion and a burnout in a conduit. An explosion in a manhole, where it almost invariably occurs, is due to the ignition of gas which has accumulated there, either sewer or illuminating gas. The gas can be ignited by an electrolytic spark from a cable sheath or from the wheels of a passing car or other causes. The result is generally the blowing off of the manhole cover, but it seldom results in damage to the cables.

These are liable to occur in telephone conduits as readily as in electric light conduits. This might be called an exterior cause, as it results from causes exterior to the cables themselves. Burnouts can be classed as interior causes, as they are caused by the breakdown of insulation in the cables. Such breakdowns result in the melting or fusing of the cables.

Faulty method of construction I consider to comprise all kinds of conduit built of conducting material, such as iron pipe, or ducts with an iron covering where joints every eight feet place the cable in contact with iron rings mechanically connected to such iron cover. In this class of construction one will readily see that a breakdown of insulation immediately charges the entire conduit from manhole to manhole. The current then flows through the breakdown to conduit and from the conduit to the lead sheath of the other cables, thereby destroying them. In tile conduits there is no such liability, for this trouble can not exist. I desire to call attention to this very important fact, that I have never been able to learn of a breakdown in a cable in one vitrified duct passing directly to a cable in another vitrified duct, unless such passage took place in a manhole.

Cables, instead of being systematically separated in manholes, have been laid up together, whereas they should all be insulated from each other, but, of course, bonded to a ground return wire capable of taking the current of any one cable to such ground return rather than allowing it to go to any other cable sheath.

Faulty method of operation, which has been the cause of a large number of burn-outs, consists in not properly watching the cables and forestalling a breakdown in insulation in them where the insulation shows deterioration. Another very prolific source of such trouble is the method of throwing the circuit-breakers at the central station back in again when they have once opened. I have known of an instance in Boston where a circuit-breaker was held in until it burnt out in the hand of the attendant.

How far should the high-tension ducts be separated from low-tension ducts? I know that six inches is amply sufficient, and I believe that three inches will accomplish the result perfectly.

Mr. Hopewell cites a number of instances supporting his opinion. Combined conduit systems are in operation in New York City; Cambridge, Mass.; Philadelphia, Pa.; Rochester, N. Y.; Baltimore, Md. (municipal ownership of conduit); Washington, D. C.; Chicago, Ill. A number of Massachusetts cities have petitioned the legislature for privilege of constructing combined conduits under municipal ownership.

The paper makes a good case for combined conduits, but is as strong as Mr. Brophy's paper in its demonstration of separate manholes for currents of large differences in potential.

Best Return of Electricity to Power House.

In a paper before the American Street Railwas Association Mr. E. G. Connette details his experiences with various methods of returning the electric current used in street railway service to the power house, and concludes as follows:

In the early days of telephone exchanges the ground was used as a return circuit, and we are all familiar with the inefficient and poor telephone service while this state of things continued. The service was disturbed by the trolley currents and other influences until finally the telephone exchanges were forced to put up a metallic return in order to save trouble, annoyance and disturbances to their service, and I believe after a trial it was discovered that the expense of putting up the metallic return was more than compensated for by the improvement in the efficiency of their service, and was money well invested.

It is, therefore, the opinion of the writer that "the best manner and mode of conducting the return circuit to the power house" is by using practically a jointless and independent metallic return, connected to each rail, and the connection made with ample surface contact and absolutely water tight, on account of the chemical action, which is likely to take place between the copper rivet and the steel rail, the rivet should be covered with a thick coating of lead, solder or tin; the best connection which can be used, if the facilities are available, is to electrically weld the connection from the auxiliary ground wire to the center of each rail, and, I dare say, that even with the extra initial cost of an independent ground wire it will result economicallily in the long run. If an independent metallic return circuit was the custom now there would be no necessity for a paper to be written on this subject; there would be no more need of discussing the subject of rail bonding or of electrolysis, or of the best method of discovering bad connections in the return circuit, and the expenditure of a large amount of money for expert investigation and advice to cure the bad results of the present imperfect system of conducting the return circuit to the power house; and the amount saved by loss of power, cost of rail bonds and labor of renewals, tests and investigations, as well as the trouble and expense incident to electrolytic action will be more than ample to ground return.

Cast iron joints and electrically welded plates on the joints make the rails of the track practically a jointless metallic circuit as a conveyance for the electric current, but the very large number of joints in the rails of the tracks makes the certainty of an unbroken and continuous metallic circuit a doubtful proposition, as the wear and tear of heavy traffic, and the expansion and contraction of the metal will, in the course of time, produce results which may very materially impair the efficiency of the joints as a perfect conductor, and it appears to the writer that it is just as essential to have a con-

ductor as perfect and as efficient in carrying capacity, to convey the current back to the power house, as is used to convey the current from the power house to the car, and if this were the case, there would be no more troubles with the return circuit. I do not advocate a double trolley, because of the difficulties which are well known to street railway people, but an independent metallic return used in connection with the single trolley system is not as expensive to install as the double trolley system, and, practically, obviates all the troubles incident to the ground return where the rails with bonded joints are used for the return circuit.

Supplemental Street Assessment Declared Legal.

Judge Carter handed down a decision Dec. 13 in the case of the supplemental assessment in the St. Lawrence-ave. paving suit at Chicago. The suit was based on a motion to dismiss the proceedings for want of jurisdiction. The court held that this motion should be overruled; that the court had jurisdiction to levy a new or supplemental assessment, no matter how irregular or defective might have been the ordinance, and that all those objectors who had heretofore escaped the payment of their assessments through technicalities could be compelled to pay them by supplemental proceedings. Upon the question of procedure as to what law controlled the method of enforcing the liability Judge Carter held that those whose assessments were defeated prior to July 1, 1897, should be proceeded against under the method established by the former law, but that all others were properly proceeded against under the new law. The present suit, therefore, was sustained as to this class and the court decided that another suit would need to be instituted as to the other class of objectors, but that all should ultimately be compelled to pay.

Paving in Council Bluffs, Ia.

Maps and figures have been filed by City Engineer Etnyre of Council Bluffs, Ia., showing the amount of paving that has been accomplished in that city during 1901. He also prepared a tabulated statement showing the following: Macadam streets, 22,400 sq. yds.; granite paving, 73,153 sq. yds.; cedar block paving, 156,500 sq. yds.; brick paving, 205,736 sq. yds.; cobblestone paving, 17,024 sq. yds.; total, 474,786 sq. yds.

The cost of brick paving during the year has averaged $1.69 a sq. yd., when a double course of Galesburg brick was laid; $1.79 for Galesburg brick on concrete; $1.67 for Des Moines; $1.33 for Council Bluffs brick for both courses.

Good Roads in the South.

Reports of the effects of the work done with the "good roads trains" on the Illinois Central and southern railroads are already coming in. Kentucky has long had many good turnpikes, but has now organized a Good Roads Association to extend the benefits of properly built highways still further. Tennessee, Mississippi and Louisiana have followed suit, and, while no result could yet be expected, material improvement in conditions is believed to be in sight. The Louisville Courier-Journal in this connection says:

The lesson of good roads is a much-needed one in the South. Southern people, with their open, generous natures, are prone to waste and extravagance, and no form of waste has cost them more than the bad roads. A system of good turnpikes, or even of the modern well-drained and well-kept dirt road, constructed according to scientific engineering principles, would be worth more than an extra barrel of corn or a fraction of a bale of cotton to the acre. With easy and cheap transportation, every pound of marketable value would be gathered and sold, and not left to rot in the fields, as is too often the case now. Besides this, country life would be made more attractive, and the value of real estate would advance.

The railroads are doing a great work both for themselves and the country through which they send these good-road trains. If they got no other return than the advertising it gives them they would be well paid, but when in addition they take steps that will insure the building up of their traffic year by year their rewards become large enough to justify heavy outlays.

Standard Methods of Testing Paving Brick.

The report of the committee on technical investigation of the National Brick Manufacturers' Association regarding standard methods of testing paving brick, which was referred to in Prof. Talbot's paper before the American Society of Municipal Improvements, printed in our November number, is issued in advance of its presentation to the association. After considering the report of the special committee on Prof. Orton's paper comparing the N. B. M. A. method with the so-called Talbot-Jones process the committee reaches the following conclusions:

First—We believe that any adequate test of paving bricks must settle the following points concerning them:

A. Their durability under exposure to such wear as they will meet in a heavy traffic street, in which sliding friction or grinding co-operates with constant blows or impacts to break down the material. To endure such treatment we believe that a brick must possess that peculiar combination of hardness and elasticity generally known as "toughness." It is not

enough for a brick to be hard. It must be elastic also, or its life in street wear will be short.

B. Their durability under the attacks of such weather as they may be called on to endure. We believe that to endure the attacks of frost bricks must be so vitrified that the pores, which form an open network through their substance in the early stages of burning, have been largely closed up by fusion and shrinkage. Any clay ware will crumble under the action of frost whose structure is conspicuously open, and which permits the absorption of considerable quantities of water, especially if the latter can accumulate in relatively large masses in any one point within the structure of the mass. Also almost every clay ware can, by proper firing, be made so dense that but little water can enter it, and little is so distributed that its collective presssure on freezing is unable to rend the ware apart. We believe that different clays exhibit wide differences in regard to the amount of water which they may safely contain on freezing, and that the process of manufacture is equally influential in determining this limit.

Second—We believe that none of the various tests heretofore proposed for determining the strength, hardness or toughness of burned clay wares compare in efficiency with some of the rattling tests We believe that neither the cross-breaking test, nor the crushing test, nor the specific gravity test represent the condition of wear in a street with sufficient closeness to make their tests convertible into terms of street wear.

We believe, also, that it is, and will always be, impossible to adopt any single absorption test which shall approximately include the safe and exclude the unsafe materials, and that wherever the absorption line is drawn, an injustice to either the maker or user of the paving brick is sure to result. As a means of judging the relative value of different stages of vitrification of any single kind of bricks, we consider this test useful and reliable, but not as a means of comparing different wares.

Third—Of all the methods proposed for conducting the rattler test, this committee has at one time or another taken cognizance. It has experimented not only on the standard proposed, but also on the several other rattling tests, and on innumerable variations in time, rate, size of cylinder and kind and quantity of charge, etc., and has arrived at its present finding by a slow process of elimination.

There are not, so far as the committee knows, any promising suggestions now before the public for any other improved method of conducting the rattling test. The committee feels that, while it desires to maintain the receptive attitude toward any improved method of test, from whatever source it may come, the chances of early or important changes are now very slight, and that the standard proposed has won its right to the public confidence and to general adoption.

Lastly, the committee desires to set before the public, in succinct and explicit form, its specifications for the conduct of the standard test.

I. Dimensions of the Machine.—The standard machine shall be 28 inches in diameter and 20 inches in length, measured inside the rattling chamber.

Other machines may be used, varying in diameter between 2 and 30 inches, and in length from 18 to 24 inches, but if this is done, a record of it must be attached to the official report. Long rattlers must be cut up into sections of suitable length by the incertion of an iron diaphraghm at the proper point.

II. Construction of the Machine.—The barrel may be driven by trunnions at one or both ends, or by rollers underneath, but in no case shall a shaft pass through the rattler chamber. The cross-section of the barrel shall be a regular polygon, having fourteen sides. The heads shall be composed of gray cast-iron, not chilled nor case-hardened. The staves shall preferably be composed of steel plates, as cast-iron dents and ultimately breaks under the wearing action on the inside. There shall be a space of one-fourth of an inch between the staves for the dust and small pieces of waste.

Other machines may be used having from twelve to sixteeen staves, with openings from one-eighth to three-eighths of an inch between staves, but if this is done a record of it must be attached to the official report of the test.

III. Composition of the Charge.—All tests must be executed on charges containing but one make of paving material at a time. The charge shall be composed of the bricks to be tested and iron abrasive material. The brick charge shall consist of that number of whole bricks or blocks whose combined volume most nearly amounts to 1,000 cubic inches, or 8 per cent. of the cubic contents of the rattling chamber. (Nine, ten or eleven are the number required for the ordinary sizes on the market.) The abrasive charge shall consist of 300 pounds of shot made of ordinary machinery cast-iron. This shot shall be of two sizes, as described below, and the shot charge shall be composed of one-fourth (seventy-five pounds) of the larger size and three-fourths (225 pounds) of the smaller size.

IV. Size of the Shot.—The larger size shall weigh about 7½ pounds and be about 2½ inches square and 4½ inches long, with slightly rounded edges. The smaller size shall be 1½-inch cubes, weighing about seven-eighths of a pound each, with square corners and edges. The individual shot shall be replaced by new ones when they have lost one-tenth of their original weight.

V. Revolutions of the Charge.—The number of revolutions of the standard test shall be 1,800, and the speed of rotation shall not fall below 28 nor exceed 30 per minute. The belt power shall be

sufficient to rotate the rattler at the same speed, whether charged or empty.

VI. Condition of the Charge.—The bricks composing a charge shall be thoroughly dried before making the test.

VII. The Calculating of the Results.—The loss shall be calculated in percentages of the weight of the dry brick composing the charge, and no result shall be considered as official unless it is the average of two distinct and complete tests, made on separate charges of brick.

Fargo Paving Ordinance Invalid.

The supreme court of North Dakota rendered an opinion Dec. 7 involving the legality of an assessment for a paving tax in Fargo. The court holds that the ordinance passed in Fargo, in 1898, creating the seven improvement districts in that city, was illegal for the reason that the vote on passage of the ordinance was not taken by yeas and nays; that it is not sufficient for the journal record to show that all members voted yea, as in fact they did. The court does not pass on the question as to whether the invalidity of this ordinance will operate to destroy the value of any securities outstanding that arise from the work of construction. The decision affects all improvements for paving and sewers that have been made in Fargo, and will probably result in considerable litigation.

The Venezuelan Asphalt Situation.

A decision favorable to the Warner-Quinlan Company has been given in the Venezuelan courts. The companies have been in litigation for a long time, and some time ago the case of the New York & Bermudez and the Warner-Quinlan syndicates was taken before the supreme court of Venezuela at Caracas to determine the question of title to the asphalt lakes. While this suit was pending the Warner-Quinlan Company went before one of the inferior tribunals at Carupano and lodged a motion to be placed in possession of the asphalt lakes pending the issue of the principal suit at Caracas. The local tribunal found for the Warner-Quinlan Company. An appeal was taken to the court of first instance at Cumano, which has decided in favor of the Warner-Quinlan syndicate, granting them a decree authorizing them to take possession. The Associated Press dispatch from Washington on Dec. 24, said:

The Bermudez Company, however, are in actual posesssion of the lakes, with a strong force of laborers, not without military training and led by capable men, including, it is understood, some of the cadets who were recently expelled from the United States military academy for hazing. It is expected they will not surrender the lakes unless the supreme court at Caracas renders a decision adverse to them.

Charles M. Warner of Syracuse, N. Y., is reported as having a dispatch from Caracas containing in substance the same information given above.

Suit Against Chicago for Damages for Street Depression.

The Illinois supreme court handed down a decision Dec. 11 to grant new hearings in the cases of John Jackson and Esther Lonegran against the city of Chicago for damages from the elevation of the Northwestern railroad tracks at Forty-seventh-st. The plaintiffs originally obtained damages against the city and the lower court was sustained by the supreme court in an opinion written by Justice Boggs, but later granted a rehearing. In the rehearing the city pleaded its right to exercise police powers in the matter of track elevation on the grounds that it was necessary to public safety. This point was so forcibly presented that the court reversed the decision of Justice Boggs and decided in favor of the city. Jackson's petition for a second rehearing did not challenge the right of the city to require railway companies to elevate their tracks when the public safety demanded it, but set up the claim that by lowering the grade of Forty-seventh-st. to go under the company's elevated track the city had left Jackson's property up in the air, and this was what had caused the damage. The contention was made that in lowering the street grade the city had exercised no police power, but only the right to control its streets as granted in the statute; that the lowering of the street was a matter of convenience to the city and was not necessary to the preservation of life, as was the elevation of the railroad.

Pennsylvania Railroad's New Tunnel.

The Pennsylvania Railroad Company has applied for state and municipal sanction to carry out one of the most unique and remarkable of recent railroad engineering plans The company proposes to tunnel the North river and Manhattan island with two single-track steel tube subways supported by piers to hardpan to a site centering at Eighth-ave. and Thirty-second-st.; to establish at that point a great underground passenger station three blocks long and three blocks in extreme width, and from there to run three single-track tube subways, a block apart, to the East river and beneath it to Long Island City. The three tube subways will converge on reaching Long Island City and will reach the surface

at a point near Thompson and Purves-aves., a quarter of a mile back from the river, where the Long Island railroad owns a large acreage. If begun immediately, the work could be done in three years, bar accidents. Its sponsors and backers hope to complete it in five. Trains will be moved through the subways by means of electric motors and for the present plans provide only for handling passenger traffic.

The profile shows that at the state ..ne on the Hudson the tunnels will be forty-five feet below the river bed. They run downward toward the Manhattan shore, entering the island sixty feet below bottom and eighty feet or more below high-water mark. Thence, following the grade of the land, they will rise until, between Seventh and Eighth-aves., where the great central station will be, forty-five feet from the surface, the highest point in the tunnel is reached. At Broadway the tunnels will be fifty-five feet below the surface, and at Fourth-ave., where the Rapid Transit subway is crossed, the depth will be more than sixty feet. At the East river pier line the depth will be only thirty feet, but between tunnel and river bottom will be solid rock.

Between the tubes running beneath the river and those under the city there will be a slight difference in form. Under the rivers and tubes will be circular. On land, where the roadbed will be stronger, the inverted horse-shoe form will be used. The tubes will be eighteen feet six inches in diameter on the inside, large enough to admit single cars, and they will be built and laid in circular sections, each about two feet long.

Worcester (Mass.) Public Work.

The annual reports of the heads of the city departments of Worcester, Mass., were submitted to the city council Dec. 16. Wright L. Prior, street commissioner, asks for the privilege of laying one good sample stretch, one-quarter of a mile of each, of granite block, asphalt, vitrified brick and wooden blocks, so that the people of Worcester may determine for themselves which of the four is best for the city. He recommends the purchase of a portable stone crusher and that they undertake the improvement of the principal roads in a suitable manner. Some views of present pavements will be found on pages 5 and 6 of this number.

Harrison P. Eddy, superintendent of sewers, calls attention to the unsafe condition of the sewer in Shrewsbury-st., and renews his recommendations that the sewer be built. He says the work accomplished by the purification plant has been far more satisfactory than during any previous year and it would seem that if necessary enlargement of the plant could be made the problem of sewage disposal would be satisfactorily solved. The sewage not filtered has been treated with chemicals before being discharged into the river. The method has not differed materially from that followed in previous years.

The net cost of the chemical treatment has been $20,079.26, which makes the cost per million gallons treated $6.41. To this should be added the cost per million gallons of sewage treated for disposing of the sludge, $5.89, making a total of $12.30. The cost of pressing the sludge per million gallons of sewage treated has been reduced $1.28 over last year. Of the various methods of treating sewage which have been tried during the year chemical purification followed by filtration gives by far the most satisfactory results, if cost is not taken into account.

The tenth annual report of Henry A. Knight, superintendent of street lighting, says the series of incandescent lights have been discontinued during the year, the locality formerly served by them being lighted by arcs or gas Welsbachs, as the conditions may require. The old open-flame gasoline service has been entirely discontinued and gasoline Welsbachs substituted during the period covered by this report.

The annual report of Frederick A. McClure, city engineer, reviews the work done by his department in surveying for streets and sidewalks and in the preparation of plans for the sewer department. He calls attention to the city's water supply and recommends that immediate steps be taken to acquire the Asnebumskit watershed, which has been reserved to the city in the act creating the metropolitan water system.

Points on Cement.

W. R. Butler, C. E., Toronto, recently gave to the Canadian Society of Civil Engineers the following abstract of papers on cement, read before British engineering societies:

In the first paper, the importance of fineness of grinding is particularly emphasized, and its effect upon the cementitious value is discussed at some length; incidentally it is pointed out that fine grinding, as also the process of air slacking, both have the effect of reducing weight, and, in speaking of the value of weight as a criterion of quality, the author shows that insistence upon a certain standard weight may sometimes lead to the acceptance of a hot (or imperfectly slaked) cement, or of one of inferior fineness. Variations in the weight of samples of the same cement, weighed at different ages, are given, as follows:

Age.	Weight per Bushel.
One day	117 lbs.
One month	113 lbs.
Two months	108 lbs.
Twelve months	103 lbs.

And, as examples of variation in weight due to grinding to different degrees of fineness, the following are quoted: A cement leaving 10 per cent. residue in an 80 mesh sieve weighed 110 lbs. per bushel; one leaving 20 per cent. weighed 116 lbs., one leaving 25 per cent. weighed 121 lbs., and one leaving 35 per cent. weighed 122 lbs.

The author considers that the chief value of chemical analysis, as capable of application by the average user of cement, lies in the easy detection, by its means, of the presence of sulphur, or magnesia, in dangerous quantity; beyond this, the tests which he regards as of the greatest practical importance are those for (1) fineness; (2) soundness; (3) tensile strength. The economy is referred to of securing a finely ground cement rather than one containing a sensible proportion of a practically inert substance, or of particles the complete hydration of which, in the author's opinion, may be so long delayed as to endanger the integrity of the mass when this hydration finally takes place; at the same time the wisdom is questioned of pushing the demand for fineness to an extreme; firstly, because the manufacturers can meet the demand by using a softer clinker, and, secondly, because of the practical difficulties in the way of testing the exact fulfilment of such demands. Not more than 10 per cent. residue, by weight, upon a 5,800 mesh sieve is suggested as a sufficiently exactly test of fineness for practical purposes. The author's experience has given him the utmost confidence in the reliability of the "Prussian" or "Pat Test," in conjunction with "Faija's Steam Test," as applied to soundness. In discussing the value of tests of tensile strength the quick development of strength which is exhibited by an over-limed cement is noticed, and an instance is quoted in which strengths of 330 pounds in water and 740 pounds in air were attained by a certain cement, after twenty-eight days; the briquettes, however, afterward suffered complete disintegration through subsequent hydration of free lime. The indication of real value, it is pointed out, is that of a fair induration after seven days; the exhibition, say, of a tensile strength of 350 to 400 pounds per square inch—with an increase of strength of at least 30 per cent. in twenty-eight days. Attention is called, in the paper, to the effect, upon the apparent strength, of the rate at which the scale is loaded in the testing of briquettes; a slow loading from zero upward generally leads to a lower "breaking weight" than if the test is begun with an initial loading, equivalent, say, to 100 pounds—it is the author's practice to begin with a load of 100 pounds applied in 15 seconds—examples of these variations are given. The difficulty is referred to of carrying out "sand tests" in accordance with any standard, as sands of quite different character may each of them equally well fulfill almost any washing or sifting tests that can be applied to them. In the discussion upon the paper, however, the importance of the retention of the sand test was a good deal emphasized, notwithstanding its difficulties, particularly as it might often serve to detect the presence of adulterants. The effect upon the tensile strength of the addition to the cement of dilutent, such as pure sand, or Kentish rag, might be hardly perceptible until the further addition of sand had increased the total quantity of inert matter to a certain proportion, but after this proportion has been exceeded, the further addition of sand leads to a much more rapid reduction of strength than is shown by the same additions to an unadulterated cement. The addition of any adulterants, such as sand, slag, ragstone, etc., the author condemns most emphatically; he quotes instances showing the danger of the presence of slag in a cement which is to be used in damp situations, and it is also shown how the addition of such adulterants must of necessity lessen the cementitious value of the material which fills the interstitial spaces in a rightly proportioned aggregate. The presence of ragstone can be detected by its effervescence with hydrochloric acid, and by the dark green color of fracture in a briquette, when broken after immersion in water for seven days. A test for the presence of ragstone formulated by Mr. Yardley, analytical chemist, is given as under: "Place on a clean silver coin a thin layer of suspected cement, drop a small quantity of dilute H_2SO_4 on it [$H_2SO_4 + 7H_2O$], then rinse with water. If the cement is genuine, the treatment with acid will slightly affect the color of the silver, but if slag is in strong proportion, a dark brown stain will be produced on the silver. In the discussion on this paper difference of opinion was expressed as to the relative order in importance of the three principal tests discussed by the author, viz.: fineness, soundness and tensile strength, and also with respect to the best practical standard of fineness; a smaller residue upon a coarser sieve than a 5,800 mesh received some advocacy, say 2½ per cent. residue upon a 2,500 mesh—the gauge of the wire also to be duly specified. It was generally agreed that tensile tests, to be truly satisfactory, ought to cover a long period, and ought to reveal a gradual and progressive induration.

The author of the other paper discussed the observed effects upon the time of setting of a cement, produced by the solution in the gauging water of such substances as soda, bicarbonate of soda, sugar, salt and glycerine, in varying quantities. Soda was found to produce a marked acceleration in the setting, when added to the neat cement in the proportion of 1.44 per cent. The experiments were carried out with two different samples of cement, the chemical analyses of which are not, however, given; in the cases of both the effects were very similar. The time of setting was reduced, in the one case, from 9.5 minutes to half a minute, and in the other

case, from eight minutes to one minute; complete setting taking place in both cases in one hour and forty-eight minutes. As the quantity of soda was increased above 1.44 per cent., the setting in the case of both cements was retarded, though it was still more rapid than when pure water was used in gauging; all of the other above-mentioned ingredients had a decided effect in retarding the process of setting. Experiments upon the effect of such additions upon the tensile strength had, at the date of the paper, only extended over a period of fifty days; they showed a perceptible diminution in strength in the case of the soda briquettes, but a striking parallelism between the curves of induration (plotted to time ordinates), of the pure cement briquettes, and the soda briquettes, respectively. The great value, under some circumstances, of a reliable means of securing rapid setting, was commented upon in the discussion of the paper. The fact indicated by the experiments seems to be that the addition of a small percentage of soda to the gauging water will have a marked effect in the acceleration of the process of the setting of a cement; and, as many cements naturally contain a small quantity of soda, the quantity to be added to produce the best results will probably vary from 1½ to 2½ per cent.

Consolidation of Mortar.

A note in a recent issue of the proceedings of the American Society of Civil Engineers by George W. Rafter gives the results of some experiments on the consolidation of mortar. For dry mortar mixed in proportions of 1 of cement to 1, 2, 3 and 4 of sand, with 15.5 to 17.4 pounds of water per cubic foot of mortar, the average consolidation under ramming for 9 experiments was 5.4 per cent., the results usually varying from 4.1 to 6.9 with one result as low as 0.9 and one as high as 10.9 per cent. For three experiments with plastic mortar, using 16.7 to 19.0 pounds of water per cubic foot, the average consolidation was 4 per cent. The average of all the results was 5.1 per cent. The result of 10.9 per cent. is attributed to insufficient mixing of the mortar.

Huntington Sewer Assessment Should be Made Under New Law.

A decision was rendered at Huntington, Ind., Dec. 12, by Judge Adair in the appeal taken by H. N. Reichart and others from the State-st. sewer assessment. The question involved was whether or not the assessments of benefits should be made under the Barrett law or under the city improvement law passed by the last legislature. The city insisted that the contract made under the old law would have to be completed under that law. The plaintiffs claimed that the new law was a complete substitute for the old one, and that the rights of the contractor had not been impaired by the passage of the new law. The old law provided for no appeal from the report of the city commissioners, but this one does. Judge Adair overruled the motion to dismiss the appeal and the case will be carried to the higher courts for settlement.

The Use of Portland Cement in the United States.

The latest annual report of the United States geological survey has the following data regarding the use of Portland cement in the United States, the last line, giving the data for 1900, being added from subsequent special reports of the bureau. The figures are in barrels:

Year.	Production.	Imports.	Total Used.
1890	335,500		
1891	454,813	2,988,313	3,443,126
1892	547,440		
1893	590,652		
1894	798,757		
1895	990,324		
1896	1,543,023	2,989,597	4,532,620
1897	2,677,775	2,090,924	4,768,699
1898	3,692,284	2,013,818	5,706,102
1899	5,652,266	2,108,388	7,760,654
1900	8,500,000	2,386,683	10,886,683

The column giving total amount used should have corrections in the last three items for exports of American cement which amounted in 1898 to 36,732 barrels; 1899 to 110,272 barrels, and in 1900 to 157,919 barrels. The use of cement increases each year in a rapidly increasing ratio, which has apparently not yet reached its maximum. The amount exported, though small as yet, is evidently increasing. Prior to 1898 the amount was not large enough to consider seriously, and is now not 2 per cent. of the total production, but it shows an increase which from present indications will be much greater in the near future.

Sewers for Snow Dumps.

The city of Detroit, under the direction of Commissioner Moreland, is using the large, nine-foot sewer running twenty-two feet below the surface of Woodward-ave. to carry off the slush and snow, instead of shoveling the same into wagons to be carted off to the river at a cost of 50 cents and upward per load. Wide hand scrapers were used by the men to push the snow and slush to the sewer manholes, one man being stationed in the sewer below to see that no clogging occurred. But there seemed to be little occasion for this precaution, as there was found to be three feet of water in the sewer with a current of five miles an hour. The temperature in the sewer and of the water itself being so much warmer than of the snow greatly facilitated the work, as the snow thawed al-

most immediately on being thrown into the sewer.

Mr. Moreland was more than pleased with his experiment, and proposes to follow it up by using horse scrapers instead of hand scrapers, if found practicable.

With good flow in a fairly large sewer this method of getting rid of snow has proved successful elsewhere, but small sewers with little flow of sewage are soon clogged. Indiscriminate application of the method should, therefore, be discouraged.

Washington Reservoir Completed.

Col. Miller, engineer officer in charge of the Washington water supply, recently reported to the War Department that water was turned into the new reservoir near Howard university through the aqueduct tunnel on Nov. 25. He said that previously the reservoir had been partly filled from the city mains, but the water from lack of pressure rose only to an elevation of 125 feet above tide. After putting the tunnel into service the reservoir rapidly filled, the water rising to an elevation of 140.2 feet by 9 a. m., Nov. 30. As far as its ability to hold water is concerned, the reservoir fulfills the most sanguine expectations. If there is any leakage it is very small, there being no indications of seepage even in the brick sewer around the reservoir, where seepage was expected. The reservoir is now entirely ready for the use of the water department of the District of Columbia in supplying the residents on the high levels in the city and will be put into practical operation as soon as the district authorities have made the necessary connections. Work on the shaft houses, grading around the east gatehouse and completing the pipe lines to the reservoir is still in progress. Screens and stop-logs are being placed in the gatehouses and drawings are being made for the regulator house at the filtration plant. The filtration plant at the "initiatory" post, Fort Myer, Va., will be installed during December.

Condemnation of Land for Pipe Line in New Jersey.

The New Jersey supreme court rendered a decision Dec. 2 affirming the order by which Jersey City was authorized to take by condemnation, for temporary use lands at Brookdale Farm, Passaic county, needed in constructing the pipe line for the new water supply. The order was attacked by the owner of the farm, Henry Hepburn, who contended that condemnation could be employed only to secure permanent rights or property. Under the contract P. H. Flynn, the contractor, is required to secure by condemnation or purchase for the perpetual use of the city a strip of land forty feet wide for a right of way for the pipe line. There was no serious trouble in condemning land for these permanent uses, but some time ago the contractor found that in prosecuting the work along the pipe line it was necessary to use extra land on either side of the forty-foot strip to haul material and pipe lengths. Some of the farmers objected to having the contractor's men walk over and traverse a strip of land outside of the forty-foot strip which the contractor had condemned or purchased, and refused to let him use, even for a short time, any land not included in the forty-foot strip unless they were paid for this extra privilege. Justice J. Frank Foot, who filed the opinion, says the correct interpretation of the rule is that a municipality should not be allowed to take any interest or estate in land beyond that necessary.

Right to Charge Meter Rates Upheld.

Chancellor Heiskell has rendered a decision in the case of W. A. Collier against the Artesian Water Company at Memphis, Tenn., in which the question was raised as to wnether the defendant should be compelled by mandatory injunction to furnish the complainant with water after a refusal on his part to pay the meter rates. Chancellor Heiskell decided in favor of the Artesian Water Company, stating that if the plaintiff wished to be furnished with water he must pay the charges demanded by the defendant. If they were unjust and extortionate the plaintiff could come into a court of law and recover them.

Judgment for Extra Work on a Chicago Tunnel.

The Illinois supreme court handed down a decision Dec. 18 in the case of John McKechney and John McKechney, jr., surviving parties of the firm of Weir, McKechney & Co., vs. the city of Chicago. The suit was filed in Cook county to recover from the firm for the work done on the northwestern land tunnel, which is used for the purpose of conducting water to the northwest part of Chicago. The contract was let in August, 1895, and subsequently a supplemental contract was drawn by the commissioner of public works and the contractors for extras, owing to difficulties encountered in the work of construction. The work was completed in October, 1895, but a disagreement arose over the supplemental contract. A suit followed and in August, 1899, the appellate court gave the contractors judgment for $555,560, and this decision is affirmed by the supreme court,

which holds that if the provision of the original contract authorizing the commissioner of public works to determine the value of work added by alterations was valid, then the commissioner had power to make the supplemental agreement.

Streator Aldermen Accused of Bribery

At a meeting of the city council of Streator, Ill., Dec. 16, a sworn confession of John Hull Becker, an agent of the Lafayette Bridge Company, was read, implicating five former aldermen in the charge of bribery. In September, 1897, Becker secured a contract for the Lafayette Bridge Company for a bridge costing $24,800. In his confession he says it was necessary to bribe five aldermen to secure the contract. The city afterward fought acceptance of the bridge in the courts. The attorneys of the bridge company, after seeing the confession of Becker, dismissed the case at the company's cost and the bridge was ordered removed. The city clerk was instructed by the council to transmit the confession to the state's attorney, and it will be brought before the grand jury with the idea of having the ex-aldermen indicted. In his confession Becker names the men and the amounts they received.

Tests of Steam Pipe Coverings.

A series of tests of steam pipe coverings, extending over a period of about six weeks, was completed in November at the power house of the Manhattan Railway in New York and a full report of the methods and results has just been issued. The descriptions of apparatus and methods show that Mr. George H. Barrus, the engineer in charge, has exercised the care and thoroughness for which he is noted. The comparative and absolute efficiency of the leading pipe coverings was to be obtained for the benefit of the company named. On Oct. 12 the experimental apparatus was exhibited and criticisms were received. At various times the installation was examined by the representatives of the various coverings and changes were made at their suggestion. None of these changes materially altered the results obtained from the coverings.

The tests were made in three different classes: (1) coverings for 2-inch pipes under 80 pounds pressure of steam; (2) coverings for 2-inch pipes under 150 pounds pressure of steam, and (3) coverings for 10-inch pipes under 150 pounds steam pressure.

The object being to determine the amount of condensation of steam in the pipes, precautions were taken to supply dry steam at the entrance; suitable inclination of pipes to drain all water of condensation to the collecting casks; thorough venting of drip ends of pipe to prevent collection of air, and proper arrangements for collecting and measuring the water discharged.

Separators and proper connections thereto secured the first object, which was further tested by gauges and calorimeters. The 2-inch pipes had a total drop of 16 inches in their length of 100 feet, and the 10-inch pipes had a drop of 6 inches. The venting of air was secured by the attachment of a ¼-inch air pipe to each drip-end, at a point about ½ inch above the line of the bottom of the pipe inside. The drip-end of each test pipe was provided with a vertical drain pipe of the ½-inch size, provided at the bottom with a ½-inch globe valve. Attached to the pipe above this valve was a glass water gauge. By means of this glass gauge a knowledge was had of the exact state of the water condensed in the pipe, and by suitable regulation of the discharge valve the water could be kept drawn down continuously to the desired mark, and all the water discharged to the weighing cask as fast as it collected. That all the water discharged under the pressure to which it was subjected in the test pipe might be recovered without loss of evaporation when the pressure was relieved, the cask was partly filled with cold water at the beginning of a test, and the highly heated water was quickly cooled. Each cask rested on an independent platform scale, which read to ¼ pounds, and the rate of condensation in the pipe for any interval of time, such as a half hour, or an hour, was the increase of weight shown on the scales for that period of time. It will be observed that a considerable blow of steam occurs from the vent pipes. This is steam in every case, and not water of condensation from the test pipe, and it insures the complete ventilation, so to speak, of the interior. The coverings themselves were bought in open market, and intended to be samples of the coverings which are ordinarily supplied by the various manufacturers in the ordinary course of business. They were applied by workmen familiar with the application of pipe coverings, under intelligent supervision, and well butted, jointed and secured. During the progress of the tests they were frequently pointed up with cement where the joints through continued service had become defective, the same as would be done by the repair force having the care of a steam plant in commercial service, which is well kept up.

Four of the pipes under eighty-pound

pressure were tested continuously with four different coverings, being under test eight to nine hours a day for each day of the week. A fifth pipe was covered with each covering in succession and tested for about a week, thus subjecting each covering to the same conditions as nearly as possible. To some extent the same system was followed with the pipes under 150 pounds pressure.

All the water resulting from the preliminary heating of the pipes and coverings and the draining of the apparatus at the end was collected and weighed in the casks, in addition to that condensed during the period of normal conditions. Half-hourly observations were made of the weight on each scale, so that the condensation due to the preliminary heating could be separately determined, and the record of the test ascertained for any smaller period desired than the whole day's run. The temperature of the air surrounding the pipes was shown by thermometers properly attached and distributed, and the condition of the air as regards humidity was shown by wet and dry bulb thermometers. The pressures were shown by gauges and the temperature of the steam by two thermometers placed in wells which were sunk within the steam pipes. The temperature of the water discharged from the pipes was shown by thermometers in two of the pipes. The temperature of the outside surface of the coverings was found by thermometers, and also pans of water well protected by hair felt. No air currents were at any time found of sufficient force to move a delicate anemometer in the least.

The order of efficiency of the coverings was as follows:

For 2-inch coverings, 80 lbs. pressure: 1. Johns' Asbestocel. 2. New York Air Cell. 3. Carey's Moulded. 4. Johns' Moulded. 5. Gast's Ambler Air Cell.

For 2-inch coverings, 150 lbs. pressure: 1. Johns' Asbesto-sponge Hair Felt, 3-ply. 2. Johns' Asbesto-sponge Hair Felt, 2-ply. 3. Asbesto-sponge Felted (sectional). 4. K. & M. Magnesia (85 per cent. carbonate of magnesia). 5. Asbestos Fire Felt (Navy brand).

For 10-in. coverings, 150 lbs. pressure: 1. Johns' Asbesto-sponge Felted. 2. K. & M. Magnesia (85 per cent. carbonate of magnesia). 3. Asbestos Fire Felt (Navy brand). 4. Watson's Imperial.

The minimum and maximum rates of condensation per hour for each of the coverings tested were as follows:

For 2-in. coverings, 80 lbs. pressure, length of test pipes 100 ft.: Johns' Asbestocel, from minimum, 13.46 to maximum 14.07. New York Air Cell, 13.88 to 14.14. Carey's Moulded, 14.18 to 15. Johns' Moulded, 14.15 to 15.07. Gast's Ambler Air Cell, 14.60 to 15.14.

For 2-in. coverings, 150 lbs pressure, length of test pipes 100 ft.: Johns' Asbesto-sponge Hair Felt, 2-ply, 10.47 to 10.93. Johns' Asbesto-sponge Hair Felt, 2-ply, 11.21 to 11.29. Asbesto-sponge Felted (sectional), 11.20 to 11.57. K. & M. Magnesia (85 per cent. carbonate of magnesia), 11.64 to 12.20. Asbestos Fire Felt (Navy brand), 13.18 to 14.

For 10-in. coverings, 150 lbs. pressure, length of test pipes 35 ft.; Johns' Asbesto Sponge Felted, 10.67 to 11.07. K. & M. Magnesia (85 per cent. carbonate of magnesia), 13 to 13.64. Asbestos Fire Felt Navy brand), 14 to 14.64. Watson's Imperial, 15.79 to 15.93.

For bare pipes: 2-in., 80 lbs. pressure, 55.75 to 60.30; 2-in., 150 lbs. pressure 71.75 to 72.20; 10-in., 150 lbs. pressure, 105.9 to 112.

The temperature of the air of the room ranged approximately from 50 degrees minimum to 75 degrees maximum.

Wyoming (O.) Streets.

The engineer of Wyoming, O., L. W. Mathewson, gives the following figures of cost of improved streets in the village:

The total cost of improving 28 streets, being all of the improved streets of the village, except Springfield and Worthington-aves., was $47,850.66. This includes the services of the village engineer, laying of drain tile, construction of inlets and culverts, purchase of 15-ton road roller and operating same for one year, advertising, etc.

Average width of macadamized roadway, 18.53 feet.

Total length of 28 streets, 53,007 feet.

Number of miles, 10.039.

Cost per lineal foot, $0.902837.

Cost per mile, $4,767.07.

Total number of square yards, 109,130.

Cost per square yard, $0.43853.

Broken stone used, including screenings, 18,316.13 cubic yards.

Total cost of broken stone loose, $35,-705.37.

Average cost per cubic yard, $1.9454.

Average depth of broken stone loose, six (6) inches.

The price per cubic yard may appear to be very high, but the expense of all grading, cutting and grubbing trees and stumps was included in this, and in addition the specifications were more rigid than for any streets heretofore constructed in Hamilton county. Before the work began the village council purchased a road roller weighing 15 tons. This proved to be a very wise act, and saved to the village treasury a large sum of money. The work done by the road roller, including the plowing and rolling of Springfield-ave., would have cost not less than $13,500, whereas the entire cost of the roller, including purchase price and operating expenses was about $4,350.

The smooth surface of the village roadways is due first, to the fact that all the stone for wearing surface were broken

to a size of 2½ inches or less; second, that a very light coat of screenings was put on, just enough to fill the interstices of the macadam without leaving a surplus to be turned into mud, and third, thorough sprinkling and rolling which was continued until a smooth surface was secured.

The expense incurred for this work was met by the issuing of bonds. But as the total cost was about 90 cents per lineal foot a very moderate investment has been made for the amount and quality of the work done.

Municipal Electric Light and Water Plant at Mishawaka, Ind.

The water works and electric lighting systems of Mishawaka, Ind., are owned and operated by the city. The two systems are located in the same building and are run by the same power plant, but are under separate management. The electric lighting system has been in operation the shortest length of time, but shows better and quicker results than the other.

According to the plan inaugurated in 1895, the revenue derived from commercial lighting pays the running expenses. This scheme has been successful from the very start. There is, however, a levy of 15 cents on the $100 for street lighting. The proceeds secured in this way are applied to the original indebtedness.

The rate charged for commercial or residence lighting is 11 cents per kilowat, with 20 per cent. off for cash. This rate is an exceptional one, and the fact that the plant is gradually paying for itself at such a low cost to consumers is evidence in itself in favor of municipal ownership of lighting facilities.

The plant was built in 1895 by a stock company of public-spirited citizens known as the Citizens' Electric Company. The intention of the company was to turn the plant over to the city as soon as completed, or whenever the city council might see fit to assume the responsibility of such an undertaking. This plan was completely carried out.

The city assumed charge of the plant Jan. 20, 1896. Bonds were issued to cover the entire purchase price, which amounted to $23,000. Since that time the equipment and buildings have been increased, so that the plant is now worth $35,000. At the same time the bonded indebtedness has decreased to $12,000. In other words, during the last six years the city has realized more than $20,000 out of the system.

The stock company sold to the city at the actual cost of building and establishing the plant.

The superintendent's report for the year ending June 1, 1901, shows a total expense account of $12,851.58, while the credits collected amounted to $13,945.72, leaving a balance of $1,094.14 to be applied on the payment of bonds. In view of the seeming small balance, the large realization to the city in six years, mentioned above, seems out of reason, but this is accounted for in the following manner: The superintendent's expense account includes money applied on building and equipment during the year, which is in no way a part of the running expenses. It is, however, an addition to the capital or better valuation of the plant.

Since June 1, 1901, it is estimated that the equipment has been increased some $3,000. In an interview the superintendent of the works said that the plant is doing $200 a month more business than last year.

Technical Meetings.

The Georgia Good Roads association was organized at Atlanta, Dec. 12, with the following officers: President, Clifton L. Anderson; vice-president, Judge W. E. Eve, Augusta; secretary, T. H. Martin, Atlanta; treasurer, J. K. Ottlay, Atlanta.

The December meeting of the New England Water Works association was held in Boston, Dec. 11. A paper on "Swamp Drainage for Water Shed Improvements" was presented by Edward S. Larned, division engineer of the Metropolitan Water Works. Freeman C. Coffin, chairman of the committee on standard specifications for cast iron pipe, presented a report of the committee. He said it was the desire of the committee that this be considered a preliminary report. It was decided to continue the discussion of the report at the January meeting. The report of the committee on uniform statistics was necessarily deferred to another meeting.

The annual meeting of the Michigan Engineering society will be held at Grand Rapids, Mich., Jan. 7, 8 and 9, 1902. F. Hodgman, secy.

The Illinois society of engineers and surveyors will hold its annual meeting in Joliet, Ill., Jan. 22, 23 and 24. A. L. Kuchn, secy, Urbana, Ill.

The annual meeting of the Brooklyn Engineers' club was held at the Oxford club Dec. 12. Officers were elected as follows: President, William G. Ford; secretary, A. J. Provost, jr.; treasurer, George C. Whipple.

The preliminary program of Indiana Engineering Society convention, to be held at Indianapolis Jan. 29-31, 1902, has been issued. It includes the following papers:

"A Tippecanoe River Water Power," by J. W. Fawcett, Delphi.

"Drainage Improvement Construction by Dredging," by E. E. Watts, Princeton.

"The Drainage of the Kankakee Marsh," by G. W. Parks, Lafayette.

"Clarks Hill Drainage," by M. W. Miller, Lafayette.

"The Strength of Reinforced Concrete," by Prof. W. K. Hatt, Purdue University.

"Masonry Arches," by F. W. Keller, South Bend.

"Concrete Arches," by D. B. Luten, Lafayette.

"Notes on Portland Cement Concrete," by S. B. Newberry, Sandusky, O.

"The Measurement of Water," by C. V. Seastone, Purdue University.

"Court Decisions Upon Stream Pollution and Health Laws," by Prof. R. L. Sackett, Earlham College.

"The Chemical and Bacteriological Side of Stream Pollution," by Prof. S. Burrage, Purdue University.

"The Present Condition of the Streams in the Counties of the State Regarding Pollution," by A. J. Hammond, South Bend.

"Road Building in Southern Indiana," by G. C. Houston, Bedford.

"Plumbing of Residences and Buildings," by J. S. Humphrey, Alexandria.

Papers are promised upon Mechanical engineering subjects by the committee on mechanical engineering, Prof. W. F. M. Goss, chairman.

Other committee reports will be presented by the committee on sewerage: B. J. T. Jeup, Indianapolis; J. S. Humphrey, Alexandria, and C. V. Seastone, West Lafayette. By the committee on water works: J. B. Nelson, Indianapolis; C. E. Cheney, Frankfort, and S. T. Mann, New Albany. By the committee on stream pollution: A. J. Hammond, South Bend; R. L. Sackett, Richmond; Severance Burrage, West Lafayette. By the committee on materials of construction: W. K. Hatt, West Lafayette; W. K. Eldridge, Indianapolis, and J. W. Fulwider, Lebanon. By the committee on surveying: H. B. Fatout, Indianapolis; R. A. Howard, Richmond, and Peter Kelley, Peru. By the committee on roads and pavements: A. W. Smith, Kokomo; J. F. O'Brien, Cloverdale, and J. A. Harding, Crawfordsville. By the committee on bridges and masonry: C. E. Waesche, West Lafayette; D. B. Luten, Lafayette, and B. F. Nesbit, Vincennes. And by the committee on drainage: F. W. Keller, South Bend; E. E. Watts, Princeton, and M. W. Miller, Lafayette.

Among the subjects which will be presented for general discussion are the "Ditch Laws of the State," proposed by R. A. Howard; "What Constitutes a Civil Engineer," proposed by W. P. Bushnell, and the "Enforcement of a Uniform Practice in Surveying, Monumenting and Recording Lands Divided Into Lots, Streets and Alleys," proposed by Chas. L. Sellers.

Receivers for the National Asphalt Company.

On Dec. 28, at Newark, N. J., Judge Kirkpatrick of the United States circuit court, appointed John M. Mack and Henry Tatnall of Philadelphia and John F. Shanley of Newark receivers for the National Asphalt Company, according to a press dispatch to the Philadelphia North American. A receivership has been anticipated, as it has been reported for some weeks that the interest on the bonds of the National Asphalt Company and the Asphalt Company of America, due on Jan. 1, would be defaulted. A report in the Philadelphia Record on Dec. 29, says:

The investigating committee formed by Thomas Dewitt Cuyler some weeks ago is friendly to the Mack-Widener-Elkins interests in control of the two concerns. This committee now controls $20,000,000 of the $30,000,000 bonds issued by the Asphalt Company of America and a majority of all the obligations issued by the National Asphalt Company through a similar committee, in which William F. Harrity is the moving spirit.

Fixed sharges amounting to $500,000 including the semi-annual interest on asphalt fives is due on Thursday next. Wide circulation was given to a report that the two asphalt companies would default these payments, and the climax came last night when it was announced that both corporations are insolvent and will be turned over to friendly receivers.

There is an issue of $30,000,000 Asphalt Company of America 5 per cent. bonds and $6,000,000 National 5 per cent. bonds, besides common and preferred stock of the National Company amounting to $18,875,000, making the total amount of $54,875,000. The bonds of the company have depreciated rapidly within a few months and the Asphalt Company of America fives sold yesterday at 33, one-third of their par value, which was the lowest price they ever brought. About two years ago they sold at 97.

New Publications.

Annual Report of the Board of Regents of the Smithsonia Institution, showing the operations, expenditures and condition of the institution for the year ending June 30, 1900. 759 pages with many plates and diagrams. S. P. Langley, secretary, Washington, D. C.

One of the functions of the Smithsonian Institution, at Washington, is the diffusion of knowledge in language "understanded of the people," and with this in view the secretary publishes with his annual report an appendix addressed to that large body of the public which has a general interest in scientific matters.

As the report just issued marks the close of the century, considerable space is given to reviews of the progress in

various branches of science during the nineteenth century by men distinguished in their various fields.

China, which has figured so much in the public eye during the year past, is given especial prominence. Exceptionally interesting among the Chinese articles is an abridged translation of a journal written by a French officer connected with the expedition to China in 1860 describing the loot of the imperial summer palace at Pekin, which illustrates in a curious manner how history repeats itself.

One article contains the first instantaneous photograph of the flying machine in its flight above the Potomac; others with colored plates, are devoted to the solar spectrum; others to the recent discoveries in malaria and other subjects of general and practical interest.

The Smithsonian reports are distributed by the institution to libraries throughout the world, may be had by purchase at cost price from the superintendent of documents, Washington city, and may generally be obtained, also, free of charge, from the applicant's member of congress.

Municipal Reports.

First Annual Report of the Department of Public Works of the City of Rochester, N. Y., for the year ending Dec. 31, 1900. J. Herbert Grant, Commissioner; Edwin A. Fisher, City Engineer; George A. Hotchkiss, Superintendent Bureau of Water.

It will be noted that the city of Rochester has changed its forms of administration of public works. This report succeeds the 24th report of the old Executive Board for 1899. It contains the report of the commissioner of public Works, 200 pages, including the Water and Engineering Bureau reports and a special report by the city engineer relating to an investigation of electrolysis, 82 pages, also issued separately, accompanied with many tables, diagrams and photographs, and a detailed index. More space is needed for a review of the reports than can be afforded here and they will be considered later. Some illustrations of the work done will also be given.

Annual Report of the Board of Public Works of the City of Milwaukee, Wis., for the year ending Dec. 31, 1901. Chas. J. Poetsch, President Board of Public Works and City Engineer.

The usual amount of public work was done during the year. The sewer system was extended by adding 3,906 feet of brick sewer and 36,382 feet of pipe sewer, making the total length of sewers in the city 328.39 miles, costing $4,179,400.23. The special sewerage pumping plant on Jones island and the Milwaukee river flushing works performed their duties as usual, the former costing for operation $25,378.15 for pumping 19 billion gallons of sewage and river water, and the latter $20,140 for pumping 125 billion gallons of lake water into the river. Street sprinkling done by the board cost $73,019.51, including charge for water used. The sweeping of 743,533,967 square feet of paved streets cost $24,290, to which must be added $1,390 for inspection. Other street and alley cleaning and removal of ashes and rubbish cost $175,592.52.

Street paving and repaving, including curbing and sidewalks, cost $542,595.65. Nearly half of this was for asphalt paving, and $64,642 for brick. Curbing cost over $86,000, and cement sidewalks $10,778. There are now in the city 51 miles of wood pavement, 8.7 miles of stone, 2.7 miles of brick, 13.9 miles of asphalt, .45 mile of Tilford; total, 76,893 miles; and 67.8 miles of paved alleys. In addition there are 234 miles graded and graveled and covered with crushed limestone and 210 miles unimproved.

The gross cost of maintaining and operating the water works during the year was $155,247.86. The receipts were $441,-844.12. Expenditures for new construction amounted to $84,274.98, for interest $45,-572.50 and for retiring bonds $176,250. The expenditures, when credited with stock on hand and repayments, fall within the receipts. There are now 25,632 meters in use, 2,747 being set during the year. There are 40,685 taps in use.

Charles E. Hollenbeck.

Charles E. Hollenbeck died at his home in Indianapolis on December 17, 1901, aged sixty-one years. He was at the head of the Hollenbeck Press, the publishing house whose fine printing has gained wide fame and has helped to make Indianapolis one of the leading publishing centers of America. Every issue of this magazine, from the time it was started, has come from Mr. Hollenbeck's printing house. He saw it grow to its present proportions from a small sixteen-page journal, with a paternal interest and pride, for his counsel and aid contributed much to its development. As one who has had a hand in the making of the magazine he has well earned a share of the kindly regard of our appreciative readers. He was a man of sterling quality. He was esteemed for his clean life, his adherence to high standards, his broad public spirit, his practical helpfulness to his fellow-men. Personally, he was a lovable man, and among the many tributes to him this stands out as the feeling of all toward him. He was always the courteous and

kindly gentleman. He was a great lover of things beautiful, with unerring sense of what was best in art, and his generous indulgence of this dominant inclination of his life brought him into close friendly touch with literary and artistic workers. Beautiful tributes to the man were given expression on the announcement of his death from the commercial, art, literary, charitable and industrial organizations of his city, with all of which he had been actively identified. His going will be deeply mourned by many; to the writer of these inadequate words, to whom he was long a close and dear friend, the loss is most grievous.

Personal.

S. Bell has resigned as city engineer of Webb City, Mo.

The Hon. William Tanda has been re-elected mayor of Mexico City, Mexico.

Morris W. Mead has been reappointed chief of the electrical bureau, Pittsburg, Pa.

Dr. Ernest J. Lederle has been appointed health commissioner of New York City.

Ernest G. Barrow, city engineer of Hamilton, Ont., has sailed for several weeks' visit in England.

Ernest W. Wicklin has been appointed assistant to the engineer of the water board at Detroit, Mich.

Harry R. Jones resigned his position as contracting engineer of the Osborn Engineering Company of Cleveland, O.

William Rich Hutton, C. E., died Dec. 11 at Clopper, the family estate in Montgomery county, Maryland, aged seventy-five years. Mr. Hutton was a well-known civil engineer in the United States and served in a great many prominent offices during his lifetime.

Arnold C. Koenig, civil and hydraulic engineer, has moved his headquarters from Grand Island, Neb., to Omaha, Neb.

Dr. John McGaw Woodbury has been appointed street cleaning commissioner of New York City to succeed Percival G. Nagle.

A. M. McClain was elected mayor, Dec. 7, at Lebanon, Tenn. B. J. Dillard, P. Y. Hill, A. W. Page and John Lanary were elected aldermen.

Conett Henry was elected mayor of Hopkinsville, Ky., Dec. 6. C. S. Jackson was elected city clerk and John A. Twyman city engineer.

L. V. Hamby has been elected mayor of Crossville, Tenn. The aldermen elected are J. M. B. Walker, W. C. Keyes, J. D. Wheeler and Samuel Cline.

Messrs. Rudolph Hering and George W. Fuller have been engaged to review plans for a water supply, water purification and sewage disposal for the city of Manzanillo, Mexico.

Prof. Shikajiro Hattori, who occupies the chair of civil engineering in the University of Tokio, Japan, is now visiting in the United States inspecting various subjects of engineering interest.

Clement Studebaker, the president of Studebaker Bros.' Mfg. Company, died at his home in South Bend, Ind., Nov. 27. He was one of the original firm of H. & C. Studebaker, who founded the business in 1852, and has been president of the present company since its formation in 1868. Resolutions of the board of directors express the general opinion regarding his abilities as an organizer, his exceptional qualities as an employer and his Christian life. The company, the city of South Bend, the state of Indiana and the nation have lost one who was conspicuous in his efforts for the upbuilding and material welfare of each.

MACHINERY AND TRADE.

Gasoline Lamps.

The gasoline lamp has taken its place in the mercantile world. It has passed through the experimental stage; the smoke of experience has cleared away, leaving the way clear for those lamps which have stood the test of continued use and proven themselves worthy of commercial recognition. There are such lamps to be had at moderate prices and reasonable terms; lamps that have stood the test of several years' continued use and under all conditions, the Brilliant, for instance, of which over 100,000 have been sold, and are in daily use in all parts of the country, giving satisfaction and meeting the expectations of those who have used or seen them in operation. It is a lamp within the reach of everybody, suitable for the home, store, factory, church or wherever good and safe light is needed. A good gasoline lamp is often better than electricity, gas or kerosene, at less than one-tenth the cost. To illustrate, one gallon of gasoline, costing about 10 cents, will run seventy or eighty hours, giving better and more light than a mammoth kerosene lamp which burns a gallon of oil, costing about 9 cents, in eight or nine hours.

Pressure lamps are proving themselves very good light where a large area is to lighted. The matter of safety is the first and most important, the matter of insurance next. The number of pounds pressure necessary to make a lamp do its work has much to do with the safety of the lamp. Some lamps require forty-five to fifty pounds pressure, while the Halo lamps work with five to ten pounds.

In the matter of insurance this is important. Some lamps and systems are barred by the underwriters, while others are only allowed by special permits at increased insurance rates. Those who are considering the gasoline method of lighting should write to the Brilliant Gas Lamp Company, 42 State-st., Chicago, Ill., for reliable information. They are the pioneers in the gasoline lamp business, as Mr. George Bohner was in the general lamp business.

With some forty years' experience in the lamp business, Mr. George Bohner foresaw great possibilities for the gasoline light. Four years ago he undertook the manufacturing and marketing of the Brilliant gas lamp. The success of this lamp bears out Mr. Bohner's judgment in the matter, for the gasoline gas lamp is proving its great usefulness, especially to people living outside of large cities. The advertisement of the company will be found on another page.

Trade Publications.

The Clinton Paving and Building Brick Company of Clinton, Ind., J. W. Robb, secretary and manager, issues a convenient vestpocket calendar and memorandum with reminders of the business of the company and the excellence of its product.

Charles Warner Company, Wilmington, Del., is distributing among its friends and customers their lime and cement notebook for 1902 in the interests of Nazareth Portland cement, Cedar Hollow limoid and their other lines. It contains valuable information and is a convenient pocket notebook. Our readers can obtain a copy upon application.

The Turner, Vaughn & Taylor Company, Cuyahoga Falls, O., issue catalogue A-37-1902 of their machinery for making chains, including furnaces, hammers, winders, link cutters and wire drawing machinery.

The Chicago Solar Light Company has issued a circular giving a number of good arguments for gasoline as an illuminant and the use of their Nulite incandescent vapor gas lamps, which is said to produce the finest artificial light in the world.

Pamphlets O-113 and O-114 of the C. W. Hunt Company, West New Brighton, N. Y., describe their electric locomotives for manufacturing establishments and an electric hoisting plant for discharging coal from vessels, in use in New York harbor.

The Contractors' Plant Company of Philadelphia has issued two circulars on their portable gravity concrete mixer. One illustrates the various combinations of parts for various requirements, and the other gives a report of a number of mechanical tests made to compare the compressive strength of concrete mixed in this mixer with that mixed by hand, showing in every case but one a material excess in strength of the machine mixed cubes. A number of fac-similes of letters of commendation accompany the circulars.

Lesley & Trinkle Company, general sales agents of the American Cement Company, Philadelphia, are distributing handsome "golf calendars" for 1902 as reminders of the cements they sell.

Trade Notes.

ASPHALT.

Adolphus Busch and C. W. Baxter of St. Louis, Mo., have purchased the asphalt claim of George Moulton of Coalgate, and his associates in Denison for $22,500. The claim is located in the Choctaw Nation, twenty-two miles northeast of Coalgate. The purchasers will form a stock company and develop the property, which is said to be very fine.

John McLaren was appointed receiver of the Assyrian Asphalt Company, Chicago, Ill., Dec. 16. Creditors, to prevent the sale of the property of the company under a judgment of $112,648, filed a petition in the United States district court in which they asked to have the concern declared bankrupt. The company's indebtedness, outside of the amount of the judgment confessed recently, is said to be about $200,000. Of this amount the Bank of Montreal of Chicago is said to hold a claim for $175,000, and the Denver national bank of Denver for $16,000. The value of the property is placed at $20,000.

The Choctaw Asphalt Company, St. Louis, Mo., has been incorporated.

The Buckeye Oil, Gas and Asphaltum Development Company, Denver, Col., has been formed to operate in Wyoming and Colorado.

The Arkansas Oil and Asphalt Company has been organized at Little Rock, Ark.

SEWER PIPE.

The manufacturers of sewer pipe, according to press reports, have perfected plans for placing the entire trade in the hands of dealers who will reorganize as manufacturers' agencies and will sell their stock on the commission plan. These agencies are to be established in New England, New York, Pennsylvania, Ohio and throughout the West in selected districts, and the price list is to be uniform all over the country and will be regulated by the manufacturers, who have formed a general association, and will hold meetings at regular intervals. All of the plants in this country, except the Anderson at St. Mary's, Pa., and the Freeman at Irondale, O., are reported as being in the agreement. The first meeting for the selection of agencies and to definitely determine on prices will be held in January.

The United Sewerage Company, Philadelphia, Pa., has been incorporated.

The first contract for machinery for the Irondale sewer pipe works has been

awarded Stevenson & Co. of Toronto, O.

The Red Wing Sewer Pipe Company, Red Wing, Minn., has been incorporated. The consolidation of all the sewer pipe interests of Red Wing was noted in the December number of Municipal Engineering.

BRICK.

The American Chemical Brick and Stone Company, Chicopee, Mass., was organized Dec. 20 by D. J. O. Beauchamp of Chicopee and Dr. C. M. Pomerat of Holyoke and others. The brick will be made by the Holchowski process, which derives its name from its inventor, a Russian. Sand is used in the composite instead of clay, and certain chemicals are used to assist in making the particles of sand cohere. Unslacked lime is used and the substance is raised to an intense heat by the application of steam, so the sand particles unite in the desired forms. After the baking process, which requires eight hours, the brick are ready to use as soon as cool. The bricks are used for ordinary purposes, and are also made in fancy styles with different colors, and sometimes into large blocks for masonry. Tiles for roofing and floors are also made by this process.

The establishment of a municipal brick plant is proposed by the city council of Atlanta, Ga., and a committee has been appointed to ascertain if a brick yard could be operated by the city on a practical business basis.

A plant will be erected at Tarentum, Pa., soon for the manufacture of vitrified and buff building brick. J. M. Stewart is interested.

CEMENT.

The work of construction on the new cement mills of the Portland Cement Company, near the present plant, at Florence, Col., was begun Dec. 2.

The bondholders of the Michigan Portland Cement Company have adopted, according to press reports, the following plan: To foreclose the mortgage of $1,000,000 on the plant and reorganize the company with $1,000,000 capital; to divide 92 per cent. of the new issue of bonds among the old bondholders in proportion to their present holdings; to give 8 per cent. of the bonds to the American Construction Company for notes of $198,000 against the defunct company. Directors were elected as follows: L. M. Wing, Coldwater, Mich.; M. D. Campbell, Coldwater; Charles Briggs, Calumet; Charles Houghtailing, Quincy, Mich.; J. T. Holmes, Detroit. Proceedings will be instituted at once for foreclosure, pending which the business will continue in operation.

The Vulcanite Portland Cement Company will open an office in the Mohawk building, 160 Fifth-ave., New York City, about Jan. 1. The office will be in charge of Albert Moyer, and Walter T. Bernon will be sales agent. The company has an office in the Chamber of Commerce building, Chicago, which is in charge of George W. de Smet, sales agent. The company's No. 3 mill, with a capacity of 2,000 barrels, will be completed and running early in 1902. This will give the company a total capacity of 4,000 barrels per day.

A consolidation of twenty-five companies controlling the principal gypsum fields of the United States was effected Dec. 24 at Chicago, under the name of the United States Gypsum Company. The company has a paid up capital of $10,000,000. The purpose of the company is to develop the uses of gypsum in the use of plaster to take the place of lime. The advisory committee of the new company is: George D. Emery, Boston; Emil Durr and S. T. Meservy, Ft. Dodge, Ia.; W. A. Avery, Detroit; Hewitt Boice, Kingston, N. Y. The principal office of the company will be at Chicago, with distributing branches at Omaha, St. Louis and Buffalo.

The Toronto Portland Cement Company, Toronto, Ontario, Canada, has been incorporated.

The Portland cement department of the Brier Hill Iron and Coal Company will erect an additional plant. David Tod, supt., Youngstown, O.

Parties interested in cement have been visiting A. H. Featherman, near Bossarville, Pa., whose property, it is believed, has a large quantity of cement rock on it.

Samuel H. Weimer of Boston, Pa., has secured an option on a twenty-acre site for a brick and cement plant, which he proposes erecting soon in Port Vue, Mo. Weimer's patent cement, common and firebrick, door frames, flagstones and a number of other materials will be manufactured.

The Sandusky Portland Cement Company, Syracuse, Ind., voted to expend $200,000 in adding to the capacity of the mill. New machinery will be placed.

The plant and property of the Buckhorn Portland Cement Company, located at Buckhorn, W. Va., were sold by Melville D. Post, commissioner, under a decree of the United States court, to John T. McGraw for $67,550.

LIGHT, HEAT AND POWER.

The Renault Insulator and Electrical Company, Aiken, S. C., has been incorporated to manufacture electrical insulators from porcelain, mica, clay, etc., and mine, wash and crush various kinds of clay. The incorporators are Edward Renault, Waldo, Fla.; Chas. Warren Davis, John O. Wicker, Geo. Nees, Augusta, Ga.

The New Jersey Electrical Construction Company, 188 Market-st., Newark, N. J., has been incorporated to manufacture electrical appliances by George W. Cook, Howard C. Baldwin and Charles E. Baldwin.

The California Gas and Electric Corporation, San Francisco, Cal., has been incorporated to acquire gas plants and machinery and manufacture and sell gas to the municipalities of San Francisco, Stockton, San Jose, Bakersfield, Oakland and other California cities.

The Black River Falls Company of Minnesota has been incorporated to manufacture electric power for lighting and manufacturing in St. Louis county.

Newly incorporated electric light companies: Western Lighting and Electric

Company, Milwaukee, Wis.; United Gas and Electric Company, Trenton, N. J.; Prometheus Electric Company, New York City; Oregon General Electric Company, Portland, Ore.; Newfane Electric Company, Newfane, N. Y.; Salisbury Light, Heat and Power Company, Salisbury, Ind.; Union Electric Light and Power Company, Logan, Utah; Mt. Joy Electric Light, Heat and Power Company, Mt. Joy, Pa.; Moodna Light, Water and Power Company, Newburgh, N. Y.; Universal Lighting and Fixture Company, Huron, S. D.; Charleston Water, Gas and Light Company, Charleston, W. Va.; Wolfe City Electric Light and Power Company, Wolfe City; Sault Ste. Marie Heat, Light and Power Company, Sault Ste Marie, Mich.; Lincoln Heat, Light and Water Company, Lincoln, Ill.

MISCELLANEOUS.

Sealed bids are asked until 12 m. Jan. 30, 1902, at Decatur, Ill., for constructing a free public library. Alternate proposals will be required for a brick and terra cotta and all stone building. W. J. Quinlan, pres't bldg. com.

The Indiana Road Machinery Company of Ft. Wayne, Ind., has purchased the Fleming Manufacturing Company, makers of road scrapers, snow plows, etc.

The Gadsden Pipe and Foundry Company, Gadsden, Ala., has been incorporated.

The Hildreth Motor and Pump Company, Lansing, Mich., has been incorporated.

The Rochester Bridge and Construction Company, Rochester, N. Y., has been incorporated by J. H. Shultz of Syracuse and T. R. Stockley and F. C. Lee of Rochester.

The Havana Construction and Supply Company has been incorporated at Trenton, N. J., to supply stone for the Dady Construction Company at Havana.

Kenney & Co., Scottdale, Pa., has been incorporated for rebuilding Kenney's machine shop, which was destroyed by fire, on a larger scale. The company has not yet made contracts for buildings and machinery, but will do so at once. The company will manufacture coal mine and coke oven machinery. A. K. Stauffer is president, D. B. Swift secretary and Walter T. Stauffer treasurer.

The Enterprise Paving Company, Pierre, S. D., has been incorporated by W. M. Breyfogel, N. B. Clark and T. P. Estes.

The Pittsburg-St. Louis Vitrified Pipe Company, 15 Exchange-place, Jersey City, N. J., has been incorporated by A. S. Meeker, C. W. Perkins and K. K. McLaren. A pipe plant will be erected in New Jersey.

A Minneapolis company has been organized to purchase and place upon the market the Decarie patents, including the Decarie garbage incinerator, automatic gully cleaner and many other attachments and appliances for water distribution and fire service.

Recent Inventions.

684,604. Oct. 15, 1901. Conduit Pipe. Albert S. Dixon, Los Angeles, Cal., assignor to Asphalt Paper Pipe Co., Los Angeles, Cal., a corporation of California. A paper composed of a convolute sheet of paper, an interposed convolute body having an asphaltum base and an asphaltum filling to unite them.

684,618. Oct. 15, 1901. Steel Cleaning Machine. Anton Schmidt, Vienna, Austria-Hungary, assignor to Marie Holanbek, same place. Brushes on endless chain taking up dirt and carrying it up with aid of bucket conveyor operating contiguously, the latter discharging into box.

684,693. Oct. 15, 1901. Chute Apparatus for Concrete Mixtures. George W. Lange, Washington, D. C., assignor to the Crawford Paving Company, Washington, D. C., a corporation of West Virginia. An apparatus for mixing, a chute or conveyor to carry mixture to hopper delivering as desired.

684,762. Oct. 15, 1901. Excavator and Conveyor. Edgar H. Taylor, Mound City, Ill. An excavating auger working horizontally, delivering earth to a vertical room in tube with elbow, which delivers to a hopper with discharge opening.

684,812. Oct. 22, 1901. Street Sweeper. Pierre Haerst, Chicago, Ill. A sweeper frame on wheels with elevator, and a sweeper behind with elevator, both discharging into removable refuse box, the machine to be pushed by hand.

684,917. Oct. 22, 1901. Pavement Construction. Charles H. Davidson, Cincinnati, O. A bottom layer of concrete, a series of wires held in tension while upper layer of concrete is laid and sets, when anchorage of wires is released.

684,996. Oct. 22, 1901. Rotary Kiln. Alexander Macfarlane, Rochester, England. A casing for a part of a rotary cement kiln provided with flanges, forming a drying chamber, an agitator and propeller of the drying material, inlet and outlet openings.

685,048. Oct. 22, 1901. Railway Tie. Dudley L. Joynt, Gonzales, Tex. Concrete with parallel strands of barbed wire embedded in it.

685,143. Oct. 22, 1901. Fireproof Floor. Hoyer-Ellefsen, Christiania, Norway. Blocks with opening for bar on which they are slipped, the block being smaller at the top than bottom, leaving openings to be filled with concrete, and also joined with mortar at adjoining surfaces along the bar. The floor surface is thus alternate spaces of blocks and of concrete.

685,335. Oct. 29, 1901. Brick-Truck. Lambert N. Legg, Calhoun, Ga. Wheels, an arched axle, a push frame pivoted to arch, lever to raise and lower arched portion, and platform attached thereto and raised and lowered therewith.

685,350. Scraper and Grader. Jacob M. Sargent, Marysville, Utah, assignor of one-half interest to John H. Fullmer, Circleville, Utah. A guide bar in the line of draft, a scraper oblique thereto and attached at front end, and a blade runner at the rear end to keep bar pulling straight, with brace bars and bolts.

685,384. Oct. 29, 1901. Road Grading Machine. Thomas McDonald, Lancaster,

Wis. A four-wheeled frame supporting scraper, with adjusting levers with slots and pins, connections and bearings and drum with chain for operating levers.

685,447. Oct. 29, 1901. Metallic Sheet Piling. George W. Jackson, Chicago, Ill. I-beams and compound beams of two channels with flanges directed inwardly and connected by stud-bolts, with space for packing strips where I-beam engage therewith.

685,599. Oct. 29, 1901. Street Cleaning Implement. Andrew M. Grey, Newark, N. J. A broom holder with a hoe on opposite side and handle, making a combined hoe and broom.

685,657. Oct. 29, 1901. Road Scraper and Grader. Wm. J. Walker and James H. Osten, White City, Kas. A tongue, cranked axle on two wheels, lever to adjust axle and tongue and adjustable scraper with vertically adjustable shoes, pivoted to tongue.

685,724 to 685,733. Oct. 29,1901. The Nernst Lamp Patents, entitled Method of Electric Lighting, Electric Glow Lamp, three patents; Electric Lighting Apparatus, Glower for Electric Lamps, three patents; Material for Electric Lamp Glowers, Ballast Device for Electric Glower Lamps. Walter Nernst, Gottingen, Germany, assignor to George Westinghouse, Pittsburg, Pa. The method consists in developing light by the incandescence of a refractory body, by electrically heating a solid conductor in the neighborhood of the refractory body, thereby raising the temperature of such body and thereafter maintaining incandescence in such body by the passage of an electric current through it.

685,953 to 685,958. Nov. 5, 1901. The Tesla patents for utilizing effects transmitted through natural media, comprising two patents on methods of intensifying and utilizing effects transmitted through natural media, two for an apparatus for utilizing effects transmitted from a distance to a receiving device through natural media, one on a method of utilizing radiant energy, and one on apparatus for the same.

683,567. Nov. 12, 1901. Portable Mortar, Concrete, or Like Mixing Machine. Alfred Wilcox, London, England. A frame on wheels with platform, tank with circular walls and doors opening down, axles carrying blades, gear wheels, water reservoir feeding perforated pipe.

686,781. Nov. 19, 1901. Cement Kiln. James D. Swindell, Pittsburg, Pa. A rotary combustion chamber and four regenerating chambers with proper apparatus to provide for their alternate use.

686,964. Nov. 19, 1901. Apparatus for use in Producing Burnt Clay Ballast. George M. Bennett and Thomas Forzham, Kenosha, Wis. A car with a boom, a pulley and cable, and a combined scraper and harrowing device for stirring the inclined surface of banks, moved by the cable which is operated by mechanism on the car.

687,519. Nov. 26, 1901. Tubular Ball Mill. Meyer J. Davidsen, Copenhagen, Denmark. A drum, partitions arranged in pairs dividing the drum into alternate grinding and conveying chambers, grinding balls in the grinding chambers, inlets, outlets and outlet valves.

IMPROVEMENT AND CONTRACTING NEWS.

PAVING.

Canandaigua, N. Y.—A wide tire law has been passed to take effect in 1909.

Bristol, Va.—Judge Stuart heard the case of the abutting property-owners, about Dec. 12, who brought suit against this city to have the paving assessments set aside or modified, but decision has been reserved.

New Orleans, La.—A party of municipal officers and business men of Camden, N. J., visited this city Dec. 10 to investigate the paving, water and sewerage of New Orleans. The topography of this city and Camden are similar, both being level.

Laporte, Ind.—The settlement of the litigation growing out of the gravel roads construction in Center and Springfield townships of this county has enabled County Treasurer Mann to sell the bond issue of $89,770 recently made by the commissioners. The work on twenty-one miles of stone roads will be begun in the spring.

CONTEMPLATED WORK.

Baker City, Or.—Brick paving is contemplated.

Lumberton, N. C.—The extension of Elm-st. is proposed.

Brainerd, Minn.—Paving is contemplated for Front-st.

Oakland, Cal.—San Pablo will be graded and macadamized.

Bangor, Me.—An ordinance has been passed for repaving Main-st.

Beverly, Mass.—A new street from Lovett-st. to the sea is proposed.

Jeffersonville, Ind.—The question of building thirty-six miles of free gravel roads will be voted on Jan. 14.

Wells, Minn.—This city contemplates laying stone gutters next season.

Port Huron, Mich.—Brick paving is desired for W. Butler and River-sts.

Ramapo, N. Y.—The sum of $3,500 has been appropriated for building roads.

San Jose, Ill.—This village contemplates building cement walks next spring.

Topeka, Kas.—Brick is proposed for Quincey and Polk-sts. J. H. Squires, cy. clk.

Washington, Ia.—Contracts for curbing, grading and paving will probably be let Jan. 6.

Springfield, Ill.—S. Eleventh-st., from Monroe-st. to S. Grand-ave., will be paved.

Mankato, Minn.—Asphalt and macadam are favored for materials for paving next season.

Benton Harbor, Mich.—The question of issuing $77,000 paving bonds will be voted on Jan. 8.

Riverside, Ind.—The citizens are agitating the question of improving the streets and sidewalks.

Spokane, Wash.—A petition is being circulated for paving Front-ave., from Port to Washington-st.

Salt Lake City, Utah.—Bids will probably be asked during January for paving S. Temple-st. with asphalt.

Champaign, Ill.—A petition has been circulated asking that 1½ miles of Springfield-ave. be paved.

Freeport, Ill.—A petition is being circulated for paving Galena and intersecting streets to Stephenson with brick.

Savannah, Ga.—An ordinance has been introduced to pave Stewart-st., from W. Broad to Watson, with vitrified brick.

Lindsay, Ont.—The question of issuing $20,000 for road improvements and road machinery will be voted on Jan. 6.

Marion, Mo.—Resolutions have been adopted providing for the construction of cement walks. Ben R. Reichard, cy. clk.

Edwardsville, Ill.—Resolutions have been passed for building brick sidewalks in certain streets. W. D. Harnist, clk.

Indianapolis, Ind.—Final action was taken Dec. 27 on the resolutions to gravel three alleys and Southeastern-ave.

Lestershire, N. Y.—Plans and specifications have been submitted for the proposed Lestershire road, 2½ miles long.

New Albany, Ind.—A resolution has been introduced for paving Market-st., from Pearl to State, with vitrified brick.

Savannah, Ga.—Ordinances have been introduced providing for brick paving on Forty-second, Berrien, Tatnall and Jones-sts.

Jackson, Miss.—Efforts are being made to secure legislation to empower this city to issue $100,000 bonds for paving the streets.

West Orange, N. J.—An ordinance has been passed for macadamizing Wellington-ave., from Freeman-st. to Hillside-ave. Joseph McDonough, clk.

Davenport, Ia.—A petition has been circulated asking that Farnum-st., from railroad shops to Tenth-st., be paved. Mayor Heinz.

Connersville, Ind. —Special.—Karl L. Hanson, cy. engr., says the city council has passed resolutions for cement sidewalks on all of the principal streets. The contracts will be let early in the spring of 1902.

Charleston, W. Va.—An ordinance has been passed for paving five streets with brick and directing the street commissioner to ask for bids.

Grafton, Pa.—The citizens of Idlewood, which was annexed to this city some time ago, will ask for an issue of bonds for street improvement.

Evanston, Ill.—Paving is proposed for Ridge-ave., from Crain-st. to the Northwestern railroad tracks. J. H. Moore, comr. pub. works.

Joliet, Ill.—City Engineer Stevens visited St. Louis Dec. 11 for the purpose of investigating the merits of rock asphalt paving.

Cienfuegos, Cuba.—The municipal council voted Dec. 9 to reject all bids submitted for paving, sewering and building water works in this city.

Cadillac, Mich.—City Engineer Teed has been directed to prepare plans and specifications for paving Mitchell-st., between Chapin and Nelson-sts.

Benton Harbor, Mich.—Asphalt paving has been decided upon for Pipestone and Territorial-sts. and brick for certain alleys. E. C. Shankland, com'r.

Baltimore, Md.—An ordinance has been passed to pave Port-st., between Townsend-st. and North-ave. with brick. John E. Hussey, ch. clk., second branch cy. coun.

Harrison, N. J.—Ordinances have been adopted for paving Davis-st. and Searing-ave. with brick or blocks and Central-ave. with asphalt. B. P. Walsh, town clk.

St. Louis, Mo.—A plan for resurfacing the granite streets with asphalt in the business part of the city is being considered by the board of public improvements.

Moline, Ill.—Seventeen blocks of asphalt paving will be done in this city. Contracts will be let in a short time. Petitions for considerable other paving have been prepared.

Los Angeles, Cal.—A resolution has been passed providing that the city council push to early completion the proposed paving of Broadway-st., from Seventh to Eleventh-st.

Syracuse, N. Y.—A petition has been submitted to the common council asking that Burnet-ave., from N. State to Catherine-st., be paved with Trinidad, Bermudez or Alcatraz asphalt.

Marinette, Wis.—The secretary of the Marinette General Improvement Association is corresponding with different firms obtaining prices on paving materials, preliminary to improving the streets.

Seattle, Wash.—The city council has under consideration a plan for grading and constructing sidewalks on twenty-five miles of streets on Queen Anne hill. The estimated cost of the work is $250,000.

St. Mary's, Ont.—An election will be held Jan. 6 for the following improvements: Building eight miles of road, $30,000; purchase of steam road roller, $3,450; steel bridge superstructure, $2,000; four arch culverts, $300 each.

Washington, D. C.—A public hearing will be given Jan. 2 on the proposed work of setting the new granite curb and laying cement walks on certain streets and paving alleys with vitrified or asphalt block. H. B. F. McFarland, chmn. dist. com'rs. The Columbia Heights Citizens' Association has asked for cement walks.

Chattanooga, Tenn.—S. M. Shambliss, chairman of the committee on public improvements, submitted to the chamber of commerce Dec. 12 the following recommendations: Asphalt paving in front of the Auditorium; new sidewalks; paving Georgia-ave., between Ninth and Tenth-sts.; renewal of house numbers and street signs.

Camden, N. J.—The street commissioner has been authorized to ask for bids for repaving Arch-st., from Fifth to Fed-

eral-st., with sheet asphalt. An ordinance has been passed for paving Princess, Kenwood, Kaighn, Pembroke, Bradley, Lansdowne, Euclid and Ormond-aves. with macadam. Benj. E. Mellor, pres't cy. coun.; H. C. Kramer, clk.

Moline, Ill.—Mayor Wessel states that he proposes to see that every petition for paving that is presented next year shall be taken care of and carried out, no matter how much is called for. Petitions have been circulated for paving Twelfth-ave., from Fifteenth to Nineteenth-st., with brick; Fourteenth-ave., from Twelfth to Fifteenth, asphalt; Eighth-ave., from Fifteenth to Eighteenth, asphalt; Eleventh-ave., from Thirteenth-st. to city hospital, asphalt.

CONTRACTS TO BE LET.

Salem, O.—Sealed bids are asked until Jan. 13 for paving E. Hight-st., Geo. Holmes, cy. clk.

Washington, Ia.—Bids will be received for curbing, grading, paving, etc., until Jan. 6. H. H. McClury, cy. clk.

Lancaster, O.—Bids are asked until Jan. 16 for constructing sidewalks and curbing. H. T. Mechling, cy. clk.

Dinuba, Cal.—Bids are asked until Jan. 6 for constructing road 624, 10 ft. wide. John Cutler, jr., clk. supervision.

Toledo, O.—Bids are asked until Jan. 10 for block paving in Church and Ontario-sts. John E. Connell, cy. clk.

Monticello, Ind.—Bids are asked until noon Jan 7, for the construction of macadam roads. J. L. Ackerman, auditor White co.

Akron, O.—Bids are asked until Jan.4 for grading, curbing and paving with brick in Grant-st. J. V. Mahar, clk. cy. comrs.

Wabash, Ind.—Bids are asked until Jan. 27 for 22,000 sq. yds. asphalt paving in Main and Wabash-sts. John Hilty, cy. engr.

Corydon, Ind.—Bids are asked by the county commissioners of Harrison county until 11 a. m., Jan. 7 for the construction of a free gravel road. James A. Watson, auditor.

Somerville, N. J.—Sealed bids are asked until noon Jan. 15 for macadamizing three roads, total length 6.98 miles. Joshua Doughty, jr., county engr.; Arthur J. Sutphen, clk of board.

Cleveland, O.—Bids are asked until Jan. 8 by Walter B. Gongwer, clerk board of control, for grading, draining, curbing and paving with brick several streets. Chas. P. Salen, dir. pub. works.

Atlantic City, N. J.—Sealed proposals are asked until Jan 8 at 11:30 a. m, for the construction of about 3 miles of gravel road. Jno. T. Irving, director, Elwood, N. J.; John J. Albertson, engr., Magnolia, N. J.

Alexandria, Ind.—(Special.)—City council has ordered plans for paving five streets with brick and sidewalks of same streets with brick and cement, about 2 miles in all. Bids will be received Jan. 18. J. S. Humphreys, cy. engr.

CONTRACTS AWARDED.

Moline, Ill.—G. H. Jordan has a contract for constructing cement walks on several streets.

Belvidere, Ill.—The Fair Cement Company has been awarded a contract for paving Logan-ave., for $4,299.

Joliet, Ill.—The R. F. Conway Company, Chicago, has been awarded the contract for paving Benton-st., with asphalt.

Oskaloosa, Ia.—The contract for five blocks of brick paving has been awarded to G. H. Carlson & Son.

Beaumont, Tex.—The contract for brick paving was awarded the Parker-Washington Company, San Antonio, at about $40,000.

Oyster Bay, L. I.—George B. Powers has been awarded a contract for repaving the West Shore drive at $2,50c.

Petersburg, Ind.—Frank Jeans of Washington, secured the contract for building twenty miles of gravel road for $63,800.

Louisville, Ky.—Fitch, Cothrell & Co. have been awarded contract for paving in two streets and L. R. Figg for paving in two streets.

Jeffersonville, Ind.—The contract for reconstructing E. Chestnut-st., has been awarded to L. F. Perdue of Terre Haute for $8,752.85.

San Bernardino, Cal.—The Alcatraz Asphalt Paving Company has been awarded a contract for repaving in Third-st., at about $2.000.

Reading, Pa.—Contract for construction of 6,000 square yards of shale block pavement at $11,000, was awarded Jacob Mayer. Alex Murdoch, cy. engr.

East Chicago, Ind.—Contract for paving streets was let to La Bounty, Morrison & Co., 611 Ashland block, Chicago, Ill. H. E. Jones, cy clk.

St. Paul, Minn.—Fielding & Shepley secured the contract for curbing and boulevarding Fuller-st., from Western-ave. to Dale-st., for $4,725.

Sullivan, Ind.—Contracts for constructing fifteen miles of macadam roads in Turman township were awarded Alkire & Martin and Dodds & Miller at $28,000.

Havana, Cuba.—The contract for paving the streets has been awarded to the Uvalde Asphalt Company of San Antonio, Tex., according to press reports of Dec. 27.

Quincy, Ill.—Theodore Von der Haar was awarded the contract for construction of sidewalk on north side of Broadway, from Twentieth to Twenty-fourth-st.

Chester, Pa.—The contract for paving Walnut-st., from Ninth to Nineteenth, with asphalt has been awarded to the Vulcanite Paving Company at $2.25 a sq. yd., 10-year guarantee.

Columbus, O.—A. G. Pugh secured contracts for paving Wall-st., from State to Broad, with Nelsonville block on concrete, and Hickory-st., from High to Front, with first-class Medina block in concrete.

Kentland, Ind.—Gamblin, Hagen & Co. of Goodland, Ind., secured the contract for building the Beaver Township stone roads at $34,000. The Brownell Improvement Company of Chicago will furnish the material.

Joliet, Ill.—Three bids were received for the improvement of Collins and Benton-sts. with asphalt as follows: R. F. Conway Company, $17,846.50; Western Paving and Supply Company, $19,997.30; Barber

Asphalt Paving Company, $20,473.50. The bids were referred to the city engineer.

Canton, Ill.—N. Heckard & Sons have secured the contract for paving N. Third-ave., from Chestnut-st. to Olive-st., at the following prices: Excavation, 19 cents per cubic yard; stone curbing, 40 cents per lineal foot; brick pavement, $11.15 per square yard; total amount of contract, $16,324. Geo. W. Chandler, cy. engr.

Toledo, O.—Contract for paving Superior-st., from Adams to Jefferson-st., with asphalt was awarded to James Sheehan at $9,918.90. H. G. Jennison was awarded the contract for paving Ontario-st., from Buckeye to Galena, with Logan block on concrete for $7,332.40. H. G. Jennison also secured the contract for paving Riverplace, from Superior to Summit, with Athens block on sand foundation at $838.75.

Nashville, Tenn.—Bids were received Dec. 19 for paving a portion of Broad, Church and First-sts. with granite, and a part of the public square and Broad-st. with brick. Bids were submitted by the Nashville Plumbing Company, Adamant Stone and Roofing Company, Nashville Bridge and Construction Company and Nashville Roofing and Paving Company of Nashville; Venable Bros., Atlanta, Ga.; W. A. Talbott & Co., Logansport, Ind.; F. M. Kemp & Sons, Middletown, O.; A. P. Pugh, Columbus, O.; Stichfield & Saunders, Evansville; Guild & Co., Chattanooga, Tenn; Adams Bros., Zanesville, O. They ranged from $1.75 to $2.82 a sq. yd. for granite and $1.33½ to $2.82 for brick.

SEWERS.

Chicago, Ill.—Joseph Hameddy instituted suit, Dec. 24, to restrain the city officials from completing the Lawrence-ave. intercepting sewer by day labor. Hameddy was the lowest bidder for the work, but his bid was rejected because the finance committee decided to complete the work under the supervision of the commissioner of public works.

CONTEMPLATED WORK.

Rushville, Ind.—The need of a sewerage system is urged by the press.

Jersey Shore, Pa.—The improvement of the sewerage system is contemplated.

Walkerville, Mont.—The question of building a sewerage system is being agitated.

Washburn, Kas.—Estimates for a sewer have been prepared. Cy. Engr, McCabe.

Litchfield, Minn.—The county board will consider ditch petitions Jan. 13 and 14.

Cambridge, O.—Plans for pipe sewers will be constructed by O. M. Hoke, cy. engr.

New Albany, Ind.—The need of a good and adequate sewerage system is urged by the press.

Salina, Kas.—An ordinance was passed Dec. 19 for the construction of 6,600 feet of sewers.

Brockport, N. Y.—A sewage disposal plant is proposed. T. S. Dean is interested.

Anglesea, Pa.—Bids will be asked soon for a new sewerage system. F. G. Rachor, engr.

La Grange, Ga.—The construction of 9 miles of sewers is contemplated. Roy Dallis, engr.

Uniontown, Pa.—The contract will be let at once for building 2,000 ft. of 15-in. sewer.

The construction of sewerage systems is contemplated at Pekin, Ill.

Muscogee, I. T.—The secretary of the interior has approved a bond issue for $25,000 for sewers.

Marion, Mass.—The citizens have voted to build a sewerage system. B. A. Conro, mun. com.

Bakersfield, Cal.—Plans have been adopted for 23,500 ft. of 8 to 20-in. pipe sewer. J. L. Evans, cy. engr.

Springfield, Mo.—Bids will be asked soon for building sewers in district No. 7. G. W. Hackney, cy. clk.

Canton, Pa.—A sewerage system will be installed by a private company, according to press reports.

Galt, Ont.—The question of issuing $6,000 bonds for improvements at the sewer farm will be voted on Jan. 6.

Peoria, Ill.—City Surveyor Janssen has been directed to prepare plans for a sewer system on the north side.

Fairmount, Minn.—The question of issuing bonds for sewers will be voted on in April. R. S. Jackson, cy. clk.

The question of issuing bonds for building sewerage systems has been favorably voted on at Newcastle, B. C.

Niagara Falls, N. Y.—The city engineer has been directed to ask for bids for extending the tunnel trunk sewer 4,100 ft.

Council Bluffs, Ia.—A resolution has been approved for 8, 10 and 12-in. sewers in three streets. N. C. Phillips, cy. clk.

Des Moines, Ia.—A sewerage system 6 mis. in length will be constructed in Highland Park during 1902. Geo. M. King, cy. engr.

Bridgeport, Conn.—Petitions have been submitted to the sewer committee asking for sewers in eight streets. Cy. Clk. Buckingham.

Geneva, O.—Estimates of the cost of building a sewerage system will be submitted by Riggs & Sherman of Toledo before the spring election.

Hancock, Mich.—Engineer Stockley has been directed to prepare plans for a complete sewerage system for the district west of Scott-st.

San Francisco, Cal.—An ordinance has been passed for the proposed sewerage system for this city and county. John A. Russell, clk. supvrs.

Dover, Del.—The question of engaging an engineer to prepare plans and specifications for a sewerage system will be acted upon Jan. 6.

Columbus, O.—The question of issuing $500,000 sewage disposal bonds and $500,000 Scioto river storage dam bonds will be voted on in April.

South Bethlehem, Pa.—An ordinance has passed second reading providing for a bond issue of $100,000 for building a sewerage system. Boro Pres't Gross.

Oswego Falls, N. Y.—The question of asking for an appropriation of $600 for the preliminary work of building a sewer for the village will be voted on Jan. 8.

Oakland, Cal.—A committee has been appointed to decide on the line of the proposed main outfall sewer in the annexed district. Cy. Engr. Turner, mem. of com.

Kansas City, Mo.—City Engineer Waddell is still investigating the matter of a feasible plan for purifying the sewage discharged by the Gooseneck sewer.

Harrisburg, Pa.—An ordinance has been introduced providing for the increase of this city's indebtedness for the extension and improvement of the sewerage system.

Swissvale, Pa.—The borough council has passed an ordinance authorizing a municipal election on Feb. 18 on the question of issuing bonds for building additional sewers.

The question of issuing bonds for constructing sewerage systems will be voted on as follows: Jennings, La.; Arnprior, Ont., Jan. 6; Berlin, Ont., Jan. 6; Perth, Ont., Jan. 6.

Haverford, Pa.—A company has been organized to construct a sewerage system in the townships of Haverford, Lower Merion, Radnor and Tudyffrin, at a cost of $1,000,000.

Baltimore, Md.—A committee from the Municipal Art Society has outlined a plan of action to be followed during the session of the legislature to secure a sewerage system. Mayor Hayes.

Lestershire, N. Y.—Plans and specifications for a sewerage system will be prepared and submitted to the State Board of Health for approval so that the question may be submitted to vote in March.

CONTRACTS TO BE LET.

Marion, Ind.—Bids are asked until Jan. 3 for building a sewer in Twenty-second-st. Cyrus G. Robbins, cy. clk.

Lorain, O.—Sealed bids are asked until Jan. 3 for building 6,950 feet of 8, 10, 15 and 18-inch pipe sewers. E. C. Loofburrow, cy. engr.

Williamsport, Pa.—Bids are asked until Jan. 29 for building 2,000 feet of 11-foot storm sewer. George D. Snyder, cy. engr.; Theo Cornman, cy. clk.

Sullivan's Island, S. C.—Sealed bids are asked until 11 a. m. Jan. 15 for constructing a sewerage and water works system at this point. David Price, Q. M.

Jackson, Mich.—Sealed bids are asked until 9 a. m. Jan. 13 for constructing intercepting sewers on each side of the Grand river. A. E. Vandercook, supt. pub. wks.

Port Huron, Mich.—Sealed bids are asked until 3 p. m. Jan. 8 for the excavation of a canal from Lake Huron to Mack river, including all steel bridges, etc. F. L. Wells, chm. canal comrs.

Akron, O.—Sealed bids are asked until 12 m. Jan. 4 for constructing sewers in Market, Howard, Livingston and Locust-sts., and Wooster-ave. with manholes, catch basins, lampholes, etc. J. V. Mahar, clk.

Charlotte, Mich.—Sealed bids are asked until Jan. 29 for constructing pipe, brick and concrete sewers, aggregating 26,160 feet, with 31 manholes, 5 drop manholes, 6 flush tanks, 11 catch basins, 28 inlets, etc. Russell S. Spencer, chm. sewer com.

Perth Amboy, N. J.—Sealed bids are asked unti 8:30 p. m. Jan. 6 for the constructing 1,400 feet of 15-inch pipe sewer in Rector and Lewis-sts. and 1,800 feet of 2x3 foot brick sewer in New Brunswick-ave. with manholes, catch basins, flush tanks, etc. Matthew Weirup, st. comr.

Elizabeth, N. J.—Sealed bids are asked until Jan. 16 for constructing a sewer along Bayway, from Staten Island sound to a point near Morris-ave. The work includes 18,622 feet of 72, 66, 42-inch brick sewer: 36 feet 36-inch c. i. pipe; 48 manholes, a wharf and bulkhead. W. L. Glorieux, chmn. joint com., Century bldg, Newark.

CONTRACTS AWARDED.

Houston, Tex.—The contract for a sewer on Fourth-st. has been awarded to N. A. Dawson.

Alexandria, Ind.—The contract for a sewer has been awarded to William Bossert of Indianapolis for $5,676.

Nashville, Tenn.—The contract for city sewer work was awarded to T. J. Pease for $41,796.

Elwood, Ind.—The sewer contract was awarded to J. D. Hoss of Indianapolis at 93 cts. a ft. for 15-inch pipe sewer.

Riverside, Cal.—The contract for building a sewer in Orange-st. was awarded to Chas. Quast for $2,833.

Ft. Dodge, Ia.—Claus King, city, has been awarded the contract for 1,480 ft. of 12-in. pipe sewer for $1,240.

New Castle, Ind.—The contract for building a sewerage system was awarded to Talbott & Co. of Logansport for $39,-906.84.

Oklahoma City, Ok. T.—The contract for building the First-st. storm sewer was awarded to Black & Laird of Kansas City, Mo., for $25,000.

Evansville, Ind.—John Newman was awarded the contract for a sewer at 33 1-3 cts. for 12-inch. pipe, $13 each for manholes and $1.10 for Y's.

Santa Clara, Cal.—F. R. Dickinson secured the contract for extending the Fremont-st. sewer 200 ft. at 30¾ cts. a ft. and $8 each for manholes.

Sault Ste. Marie, Mich.—The contract for building the trunk sewer has been awarded to J. H. Green & Sons of Appleton, Wis., for $71,064.70.

Pittsfield, Mass.—The contract for building the new brick pumping station and screen house for the outfall sewage system was awarded to J. J. Prindeville of South Framingham for $9,548.

WATER-WORKS.

Pleasantville, N. J.—C. T. Leland, P. D. Wanner, Howard E. Ebrend, C. A. Campbell et al. have organized a water company.

Muscatine, Ia.—The Muscatine city water works, valued at $100,000, were sold Dec. 9 for county taxes, amounting to $806.

Sandusky, O.—J. D. Cook, C. E., of Toledo, examined the local water works system recently and reported that the 180-foot stand-pipe may collapse at any moment.

Pittston, Pa.—A reservoir failed Nov. 28 by being filled to overflowing. It was built by the Pennsylvania Coal Company

about 30 years ago and has been used by the Erie Railroad Company.

Helena, Mont.—Judge Knowles of the federal court issued an order Dec. 23 restraining this city from building water works during the life of the present franchise with the Helena Water Works Company.

Ft. Smith, Ark.—Eastern capitalists have secured control of the Municipal Water Company and will reorganize it. Superintendent Rosamond will be retained. Many improvements are contemplated.

Great Falls, Mont.—The residents of Monarch and vicinity are preparing to take active steps against the company operating the Diamond R. concentration at Neihart, on account of the pollution of the waters of Belt creek.

Bordentown, N. J.—The finance committee of common council has advised this city to apply to the supreme court for the appointment of commissioners to appraise the value of the Bordentown water plant with a view of acquiring it.

Knoxville, Tenn.—Chas. F. Cates, jr., attorney for the Knoxville Water Company has filed a bill in the U. S. court attacking the new water-rate ordinance on the grounds that it would reduce the revenue of the company below minimum expenses; that it curtails revenue to which the company is entitled, and that the new rates are unjust. A restraining order inhibiting the city from enforcing the new ordinance was issued.

Newly incorporated water companies—Mt. Prospect Water Company, Paterson, N. J.; Hobart Water Works Company, Hobart Ok. T.; Pueblo Water Supply and Power Company, Pueblo, Col.; Raccoon Water Company, Aliquippa, Pa.; Wilkinsburg Water Company, Wilkinsburg, Pa.; Winters Water Works Company, Winters, Tex.; Keswick Water Works, San Francisco, Cal.; Florence Water Company, Mt. Holley, N. J.; Del Rosa Water Company, Del Rosa, Cal.; Woodward Water Works and Electric Light Company, Woodward, Ok. T.

CONTEMPLATED WORK.

Spokane, Wash.—The purchase of a new pump is proposed.

Worcester, Mass.—A water supply from Asnebumskit is proposed.

East Orange, N. J.—This city voted in favor of a municipal water plant.

Pasadena, Cal.—This city voted to issue bonds for extending the water works.

Cheyenne, Wyo.—The question of increasing the water supply is being considered.

Dallastown, Pa.—The Dallastown Water Company has concluded to install water meters.

Onawa, Ia.—This city voted to improve the water works and extend the mains.

Dallas, Tex.—The question of extending the water works system will be voted on Jan. 14.

Winona, Minn.—The mills and factories will be required to put in water meters.

Caldwell, Idaho—Bids will be asked for water works as soon as the plans have been adopted.

The question of issuing water works bonds will be voted on as follows: Jennings, Ia.; Prairie du Chien, Wis.; Edgerton, Minn.; Jan. 14, Flint, Mich.; Albany, Minn.

Springfield, Mass.—The question of improving the water supply at Ludlow is under consideration.

Newton, Ia.—Plans and specifications have been submitted for increasing the water supply.

Burlington, Ia.—This city is considering a plan to secure a municipal water works system.

Lynchburg, Va.—A gravity water supply is proposed. H. L. Shanek desires data regarding works.

Muscogee, Ind. T.—The secretary of the interior has approved the bond issue for $150,000 for water works.

Petersborough, Ont.—The question of purchasing the water works system will be voted on in January.

Lynn, Mass.—A new pumping plant and the construction of an aqueduct are contemplated. Mayor Shepherd.

Groveland, Mass.—The question of furnishing better fire service and constructing a reservoir is being considered.

Jeffersonville, Ind.—A. T. Hert, superintendent of the reformatory, contemplates building water works.

Deadwood, S. D.—The city council will condemn a portion of the water in Elk creek for domestic purposes.

La Crosse, Wis.—The board of public works will enforce the ordinance requiring the use of water meters.

Grossdale, Ill.—The question of securing a supply from the La Grange city water works is being considered.

Farmington, Me.—This town has voted to purchase the water works from the Farmington Water company for $52,000

Meridian, Miss.—A committee has been appointed to investigate the question of water works and an electric light plant.

Stockton, Cal.—A water plant and power plant are proposed among the municipal questions to be voted on in March.

Crookston, Minn.—A resolution has been introduced providing for the extension of water mains across the river to Polk-st.

Los Angeles, Cal.—The water works system will be enlarged as soon as it passes into the hands of the municipality.

Cincinnati, O.—Changes are proposed in the plans for the water mains to connect with the western pumping station of the new plant.

Harrisburg, Pa.—An ordinance has been introduced providing for the extension and improvement and filtration of the water supply system.

The Massachusetts legislature has been asked to grant permission for the new water supply at the following places: Hamilton and Lexington.

Dyersburg, Tenn.—This city will vote Jan. 2 on issuing $50,000 bonds for purchasing and improving the present water works and light system.

Washington, D. C.—A filtration plant for the capitol building of 3,000,000 gallons capacity is provided in a bill which has been introduced in the house.

Minneapolis, Minn.—The city council may ask the legislature for an appropriation for improving the city water dis-

tribution system and the completion of the northeast tunnel.

St. Louis, Mo.—A bill has been introduced authorizing the appropriation of $285,000 for the construction of water mains, and $90,000 for valves, pipes and castings.

Cody, Wyo.—This town is considering the acquirement of a system of water works by uniting with the Burlington railway company in its effort to secure a water supply for its road.

The construction of water works is contemplated at the following places: Quenah, Tex.; La Veta, Col.; Kimballton, Ia.; Esmond, N. D.; Bridgeport, N. J.; Dillon, Mont.; Fairview, Mass.; Cambridge, Minn.

Blokton, Ala.—Plans and specifications for a water works plant are being prepared by Alber & Byrne, cons. engrs. of Birmingham. The plans will be ready to commence the construction work early in the coming year. E. D. Reynolds, mayor.

The question of issuing water works bonds has been favorably voted on as follows: Lewiston, Idaho; Ilvan, Ia.; Doniphan, Mo.; Bird Island, Minn.; McKinley, Minn.; Marshall, Mo.; Hennessy, O. T.; Hammonton, N. J.; McRae, Ga.; Gallatin, Tenn.; Arcadia, Wis.; Kanoka, Mo.

CONTRACTS TO BE LET.

Gloster, Miss.—Bids are asked until Jan. 7 for building a water works system. G. M. Causey, cy. clk.

Mechanicsville, La.—Bids are asked until March 3 for building waterworks. L. L. Kennedy, mayor.

Chicago Heights, Ill.—Sealed bids are asked until 6 p. m., Jan. 6 for pumping machinery. P. F. Jirtle, cy. clk.

Appleton, Wis.—Sealed bids are asked until 6 p. m., Jan. 21 for constructing a water works system. A. E. Heideman, cy. clk.

Sulivan's Island, S. C.—Sealed bids are asked until Jan. 15 for constructing a water works and sewerage system. David Price, Q. M.

Alexandria, La.—Bids are asked until Jan. 7 for furnishing an air lift compressor for the water works. L. W. Sylvester, cy. engr.

Yardley, Pa.—Bids are asked until Jan. 14 by the Yardley Water and Power Company for constructing water works. C. A. Clayton, secy.

Calumet, Mich.—Bids are desired until April 1 by the Centennial Heights Water Company for building water works. Capt. J. Smith, engr.

Sacramento, Cal.—Bids are asked until Jan. 13 for furnishing a 5,000,000 gal. and a 10,000,000 gal. vertical triple expansion pump. Bd. of trustees.

New Ulm, Minn.—Sealed bids are asked until 7:30 p. m., Jan. 21 for furnishing boilers and a traveling crane for the Northeast pumping station. L. A. Lydiard.

Port Huron, Mich.—Sealed bids are asked until 12 m., Jan. 6 for building and installing two tubular boilers in the pumping station. Wm. H. Avery, cons. engr.

Pittsburg, Pa.—Sealed bids are asked until Jan. 21 for furnishing and erecting two compound pumping engines at the Brilliant pumping station and one triple compound pumping engine at the Herron Hill pumping station. J. Guy McCandless, dir. dept. pub. works.

CONTRACTS AWARDED.

Flora, Ill.—The Flora Light and Water Company has been awarded a contract for water works for $62,000.

Clifton, Kas.—The contract for laying the water mains for the water works system was awarded to D. Lake of Clyde.

Woodbury, N. J.—The contract for a new pumping engine was awarded to R. D. Wood & Co. of Philadelphia for $6,400.

Pruntytown, W. Va.—The contract for a reservoir for the West Virginia Reform School was awarded to Rosser & Cartoe of Bellaire, O.

Ft. Wayne, Ind.—The contract for a new pumping engine was awarded Dec. 19 to the Holly Mfg. Company of Lockport, N. Y., for $27,400.

Grand Rapids, Mich.—Bids were received Nov. 26 from three parties covering sixteen propositions for furnishing this city with a new or improved water supply.

Philadelphia, Pa.—The only bidder Dec. 18 for a filter plant and basin at Forresdale and a reservoir at Oak Lane was that of D. J. McNichol. The contract will not be awarded until in January.

BRIDGES.

Elkins, W. Va.—A bridge 470 feet long will be built at Parsons across the Black Fork.

Beattyville, Ky.—On Jan. 6 the contract will be let for a 381-ft. bridge. H. L. Wheeler, Com'r.

Montgomery, Pa.—Viewers have recommended the construction of a 940-ft. four-span iron bridge.

Decorah, Ia.—Sealed bids are asked until Jan. 9 for building steel bridges. F. A. Masters, co. audt.

Dennison, Ia.—Bids are asked until Jan. 7 for building and repairing county bridges. N. J. Collins, co. audt.

Cherry Hill, Md.—It is reported that the county commissioners will erect a bridge over Harlan's ford.

West Bay City, Mich.—Bids will be received Jan. 4 for the substructure of a bridge. H. C. Thompson, engineer.

Vicksburg, Miss.—Bids are asked until Jan. 6 for a bridge on road No. 33. J. D. Laughlin, clk. chancery court.

Yazoo City, Miss.—Bids are asked until Jan. 6 for a bridge over Twelve-Mile Bayou, near Sunflower. C. S. Griffin, clerk.

Charles City, Ia.—A second bridge will be built across the Cedar river at this place at the foot of Milwaukee-st.

Baldwin, Ia.—E. J. Cain, co. auditor at Maquoketa, will receive bids soon for a 120-ft. truss bridge over Maquoketa river.

Lebanon, Pa.—A new bridge will probably be erected by the county over the Swatara river between Green Point and Lickdale.

Newton, Ia.—Sealed bids will be received until noon Jan. 6 for bridge material for the year 1902. Joe Horn, auditor.

Clay, W. Va.—Bids are asked until Jan. 20 for a bridge over Elk river, near the mouth of Big Otter Creek. N. T. Hannick, co. clerk.

Milwaukee, Wis.—The city and railroad companies will probably build a viaduct at Kinnickinnic-ave. at a cost of about $500,000.

Wilmington, N. C.—An iron or steel bridge will be erected over the Fifth-st. crossing of the A. L. L. R. R. A. M. Waddell, mayor.

Lancaster, N. Y.—A petition has been presented to the town board asking for a bridge across Cayuga creek. John Somers, town clerk.

Duluth, Minn.—Sealed bids are asked until 2 p. m. Jan. 7 for constructing a steel bridge over the St. Louis river. O. Halden, co. audt.

Chattanooga, Tenn.—Newspaper reports say a new viaduct is proposed at the Market-st. railroad crossing at a cost of about $100,000.

Florence, Col.—The county has decided to build a 115-foot bridge across the Arkansas river thirty-five miles west of here. Estimated cost, $100,000.

Washington, D. C.—The Board of Freeholders have decided to build a bridge over the Pequest creek at Hoagland's crossing, in Oxford township.

Philadelphia, Pa.—The bridge committee will soon advertise for proposals for the construction of a new bridge across Cooper's creek at Baird-ave.

Chehalis, Wash.—Bids are wanted by the county supervisors for building the Olequa creek bridge, on the Yansen road, and a bridge on the Ruch road.

Los Angeles, Cal.—City Engineer Stafford has prepared for the council estimates for five bridges in the city limits of Los Angeles and recommends their construction.

Victoria, B. C.—Bids are asked until Jan. 25 for constructing a bridge for combined highway and railroad traffic over Fraser river. W. S. Gore, dep. com'r. lands and works.

Decorah, Ia.—Bids are asked until Jan. 9 for such steel bridges, 20 to 60 ft. in length, as may be ordered by Winneshelk county for the year 1902. F. A. Masters, co. auditor.

Vicksburg, Miss.—Bids will be received at the office of Chancery Court up to noon Jan. 6 for repairing Hankinson's ferry bridge across Big Black river. J. D. Laughlin, clerk.

Denver, Col.—It is said that a new bridge will probably be erected across Cherry creek on Lawrence-st. An appropriation of $80,000 has been asked for the work.

Hume, N. Y.—A petition has been filed asking that the towns of Hume and Granger be compelled to build a bridge near the Gould Scott place and known as the Widay bridge.

Newton, Ia.—Sealed bids are asked until Jan. 6 for furnishing a bridge for one year. Also for building and repairing county bridges for one year. Joe Horn, co. audt.

Port Huron, Mich.—Sealed bids are asked until Jan. 8 for constructing a canal from Lake Huron to Black river, including all steel bridges on stone abutments and intake protection. F. L. Wells, chrm. canal com'n.

Lansing, Mich.—(Special.)—The common council has instructed the city clerk to advertise for bids for constructing a bridge over Grand river on Washington-ave., south, until Jan. 27, 1902. H. A. Collar, cy. engr.; C. J. McCullough, cy. clk.

Wichita, Kas.—A committee has been appointed in conjunction with the city engineer to secure plans and specifications for the construction of a steel viaduct on First-st., from the Santa Fe tracks to Washington-ave., a distance of about 1,000 feet.

Greensboro, Ga.—Bids are asked until Feb. 6 for an iron and steel bridge over the Oconee river having two steel spans of 144 ft. and 80 ft. respectively on cylinder piers, together with about 252 ft. of steel trestle approach, 23-ft. roadway. James L. Crossley, clk. co, comrs.

PARKS.

Oshkosh, Wis.—The question of public parks is being agitated.

Elgin, Ill.—A grove of thirty-five acres, south of the power plant, will be converted into a park.

Topeka, Kas.—A proposition to secure the fair grounds for city park purposes will be submitted to the county commissioners.

Erie, Pa.—An ordinance has been passed providing for the purchase of 112 acres for park purposes, to be known as Glenwood Park.

Benton Harbor, Mich.—The property-owners on Broadway have asked that the land lying between Broadway, extended, and Riverture-st., be converted into a park.

Atlanta, Ga.—A bill has been passed by the legislature giving certain grant in northwest Georgia to the United States for the purpose of providing a park to be known as the Appalachian national park.

Minneapolis, Minn.—The council has granted the park board authority to issue bonds for the purchase of land around Lake Amelia and along the Mississippi river, and the Taylor property, in Loring park, for park purposes.

STREET LIGHTING.

Contemplated: Hubbard, O.; White Lake, S. D.; North Adams, Mich.

Sylvania, O.—Citizens are agitating the lighting of the town streets.

Webster City, Ia.—The question of establishing a gas plant is being discussed.

Cripple Creek, Col.—The question of a municipal lighting plant is being considered.

Woonsocket, S. D.—A gasoline street lighting plant has been established by the city.

Hubbell, O.—The question of a municipal electric light plant is being considered.

Frederick, Md.—The city has purchased

property as a probable site for a new electric light plant.

Pewaukee, Wis.—The village board is considering the proposition of better street lighting.

Keyesport, Ill.—The village board has decided to install a new gasoline street lighting system.

Lost Nation, Ia.—The citizens are agitating the question of the establishment of electric lights.

Onawa, Ia.—This city voted to issue $6,000 for improving the electric lighting plant.

Nashville, Ill.—A resolution for the erection of a municipal electric lighting plant has passed the council.

Savannah, Ga.—The Edison Electric Illuminating company has acquired the street railway interests in this city.

Iron Mountain, Mich.—The citizens of Iron Mountain will petition for a municipal electric lighting plant.

North Adams, Mich.—This village is considering a proposition to put in an electric light plant for street lighting.

Minneapolis, Minn.—The question of issuing bonds for establishing a municipal electric light plant will be voted on again.

Tampa, Fla.—An election will be held Jan. 7 to vote on the issuing of $10,000 in bonds for installing an electric light plant.

McKeesport, Pa.—An election will be held to decide upon the question of issuing $100,000 in bonds for an electric plant.

Pittsburg, Pa.—The borough of East Pittsburg is considering the question of erecting a municipal electric lighting plant.

Colorado Springs, Col.—Local parties have made application for a franchise to manufacture and furnish heating and illuminating gas.

New Ulm, Minn.—Sealed bids are asked until Jan. 16 for a municipal electric light and power plant. Lewis Schilling, cy. clk.

White Lake, S. D.—The council has authorized the purchase of a number of 6,000 candle-power gasoline lamps for street lighting purposes.

Centerville, Ia.—A contract has been entered into with the Centerville Electric Light and Gas company for 45 lights. The contract is for ten years.

Chicago, Ill.—Sealed bids are asked until Jan. 4. for lighting the entire city with electricity, gas and gasoline. Cy. Electrician Ellicott.

New Orleans, La.—The city council has decided to advertise for an electric light plant under two plans, the ten-year specifications and the outright ownership.

Frederick, Md.—A new 150 to 200 h. p. engine with the corresponding boilers and two dynamos will probably be soon required for the city lighting plant. George E. Smith, Mayor.

Idaho Falls, Idaho.—An election will be held Jan. 3 to vote on proposition to issue $13,500 bonds for the purpose of improving and enlarging the electrical lighting system.

Washington, D. C.—Sealed bids are asked until Jan. 24 for a steam heating or electric lighting plant for Ft. Totten, N. D. W. A. Jones comr. Indian affairs, Washington, D. C.

Duluth, Minn.—The council increased the number of street lights from 290 to 352. The new lights will be furnished by the Commercial Light and Power Company at $55 per light per annum.

Deadwood, S. D.—A franchise for light and fuel gas service has been granted to Colby & Tenney, representing the Practical Gas Company of Chicago. The gasoline cold process will be used.

Omaha, Neb.—Sealed bids are asked until Jan. 15 for lighting the streets with gasoline lamps for two or more years, requiring about 600 lamps. Wm. Coburn, secy. advisory bd.

Huntsville, Ala.—After years of litigation the chancery court has issued a decree ordering the receiver to sell the properties and franchises of the Huntsville Gas Light Company on Jan. 6.

Hudson, Mich.—The city council has contracted with the Hudson Electric Light Company for forty arc lights for a term of five years at $60 per light per year. The system will be conducted on the Philadelphia moonlight schedule.

New York, N. Y.—Commissioner Kearney of the department of buildings, lighting and supplies received thirty-one bids for gas and electric lighting of all the boroughs of Greater New York. The bids will be tabulated and the awards announced.

Pontiac, Ill.—The city council has granted James A. Carothers a twenty-five-year franchise for an electric light plant. The city will have permission to purchase the plant after ten years. The water works has fallen to the same ownership.

Bay City, Mich.—A public meeting has been held in Esserville and sentiment is in favor of lighting the city by electricity. Sidney Hall, a local business man, proposes to erect a plant if a thirty-year franchise is given him and furnish not less than ten arc lights at $75 per annum.

Mobile, Ala.—The city has entered into a contract with the Electric Lighting Company of Mobile for 275 arc lamps, 2,000 c. p., at the rate of $75 per light per annum, the city to receive 2 per cent. of the company's gross earnings and to bind itself to a reasonable rate for commercial lighting.

Elmira, N. Y.—The city has extended the term of the present street lighting contract with the Elmira Water, Light and Railroad Company for five years at the present contract price. The company agrees to substitute 2,000 candle power enclosed arc lights in the place of the 1,200 candle power open arc lights now in use.

St. Paul, Minn.—Four bids were received by the board of aldermen for lighting the residence portion of the city with gasoline lamps. On account of non-compliance with the specifications the bids of James Torrestall & Co. and the Cleveland, O., Vapor Company were rejected, leaving only the bids of the American Developing Company and the Sun Vapor Company. The former's bid was $2.41 2-3 per month for incandescent gasoline lamps and $1.36½ for plain lamps. The latter's bid was $2.50 per month for

incandescent and $1.50 for plain. It is not at all unlikely that all the bids will be rejected and new ones called for. The assembly is in a deadlock on the question.

Brooklyn, N. Y.—Contracts for electric and gas lighting in this city have been awarded as follows: Brooklyn Union Gas Company, for gas lamps, $16 per lamp per year; for gas 90 cents per 1,000 feet; the Edison Electric Illuminating Company, 34 cents per night, per 1,200 candle power arc light and 17 cents per 600 candle power arc light; the Flatbush Gas Company, 32 cents per night, per arc light, for 65 lights on Ocean Parkway; the New York and New Jersey Globe Company, $22 per naphtha lamp, per year, and the Welsbach Company, $34 per light, per year.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Lawrence, Mass.—A garbage crematory is contemplated.

Ottawa, Ont.—This city will expend about $35,000 for a garbage crematory.

Martins Ferry, O.—The question of building a garbage crematory is being considered. Dr. J. G. Parr.

The contract for the disposal of garbage was awarded to the American Garbage Company for $489,900.

Seattle, Wash.—The construction of a garbage crematory has been recommended by City Health Officer Carroll.

Bridgeport, Conn.—Mayor Mulvihill is considering propositions from George E. Winton and others for burning garbage.

Chicago, Ill.—An ordinance is proposed authorizing all apartment buildings to install private garbage crematories.

Chattanooga, Tenn.—A contract for street cleaning was awarded Dec. 20 to B. Benkovitz for three years at 15½ cts. per hour.

Cincinnati, O.—The contract for removing dead animals, offal, etc., for a term of years was awarded Dec. 11 to Chamberlain & Corliss for $392,000.

Rochester, N. Y.—Henry Perry, to whom was awarded the contract for collecting the city's garbage next year, waived his claim to the contract, Dec. 20, owing to inability to secure the necessary cash deposit. The contract was then awarded to Thomas Holihan for $26,300.

Philadelphia, Pa.—Contracts for cleaning city streets, removing garbage and collecting ashes during 1902 have been awarded as follows: E. H. Vare, First district, $125,000; Contractor Vare, Second district, $180,000; Daniel Dooley, Third district, $65,000; James Curran, Fourth district, $184,000; David McMahon, Fifth district, $138,000; Richard I. Bennis, Sixth district, $28,890.

FIRE APPARATUS.

Winfield, Kan.—The purchase of an up-to-date fire wagon is proposed.

Brazil, Ind.—This city contemplates the purchase of 32 feet extension ladder and a dozen rubber buckets for the fire department.

Carnegie, Pa.—The borough council has decided upon an improved fire alarm system.

Nelson, B. C.—About $5,000 will be expended on a fire alarm system.

Grant's Pass, Ore.—The purchase of 500 fet of hose has been authorized.

Fremont, Neb.—This town contemplates the purchase of 500 feet of fire hose and a cart.

Pasadena, Cal.—Bonds were voted Dec. 9 for the improvement of the fire department.

Long Prairie, Minn.—The purchase of a chemical engine is contemplated by the city council.

Whittier, Cal.—A bond issue of $5,000 is proposed for the purchase of fire apparatus.

Brainard, Minn.—The council contemplates the purchase of a combination chemical wagon.

Uniontown, Pa.—This city contemplates the purchase of a number of new nozzles and a ladder truck.

Rushville, Ind.—The fire committee is considering the proposed purchase of a deluge net and a release valve.

Omaha, Neb.—The purchase of four new hose wagons, a new fire engine and 7,600 feet of hose is contemplated.

Fulton, Ill.—The purchase of two hose wagons, 1,000 feet of hose, etc., is contemplated by this city.

Hastings, Minn.—The fire department committee has been directed to purchase a new water tank for the engine house.

Harrison, Idaho—The fire department is in need of ladders, hose cart and other apparatus, according to press reports.

Freeport, L. I., N. Y.—The village hose company has appointed E. S. Randall, Gilson Raynor and Walter Hess a committee to procure new dress uniforms.

Denver, Col.—The chamber of commerce has asked the city authorities to invest in three new steam fire engines, 10,000 feet of hose and to purchase annually hereafter 5,000 feet of hose and two new hook and ladder trucks

TOO LATE FOR CLASSIFICATION

Slayton, Minn.—A water works and electric light system are urged by the press.

Eagle Grove, Ia.—The contract for building a sewer has been awarded to Dunnegan & Sullivan.

New London, Wis.—Plans for a water works system have been prepared by George C. Morgan, C. E., of Chicago.

Winona, Minn.—Plans for a water works system for Sugar Loaf will be prepared by the city engineer of this city.

St. Paul, Minn.—Sealed bids are asked until 2 p. m., Jan. 6, for paving E. Tenth, Lafayette, Collins and S. Wabash sts. and Selbey-ave.

Omaha, Neb.—The county board and the park commission have in contemplation the paving of Thirtieth-st., from Fourth-st. to the town of Florence, with brick.

The general sales offices of the Alpha Portland Cement Co. have been removed from the Betz building, Philadelphia, to the works at Alpha, N. J.